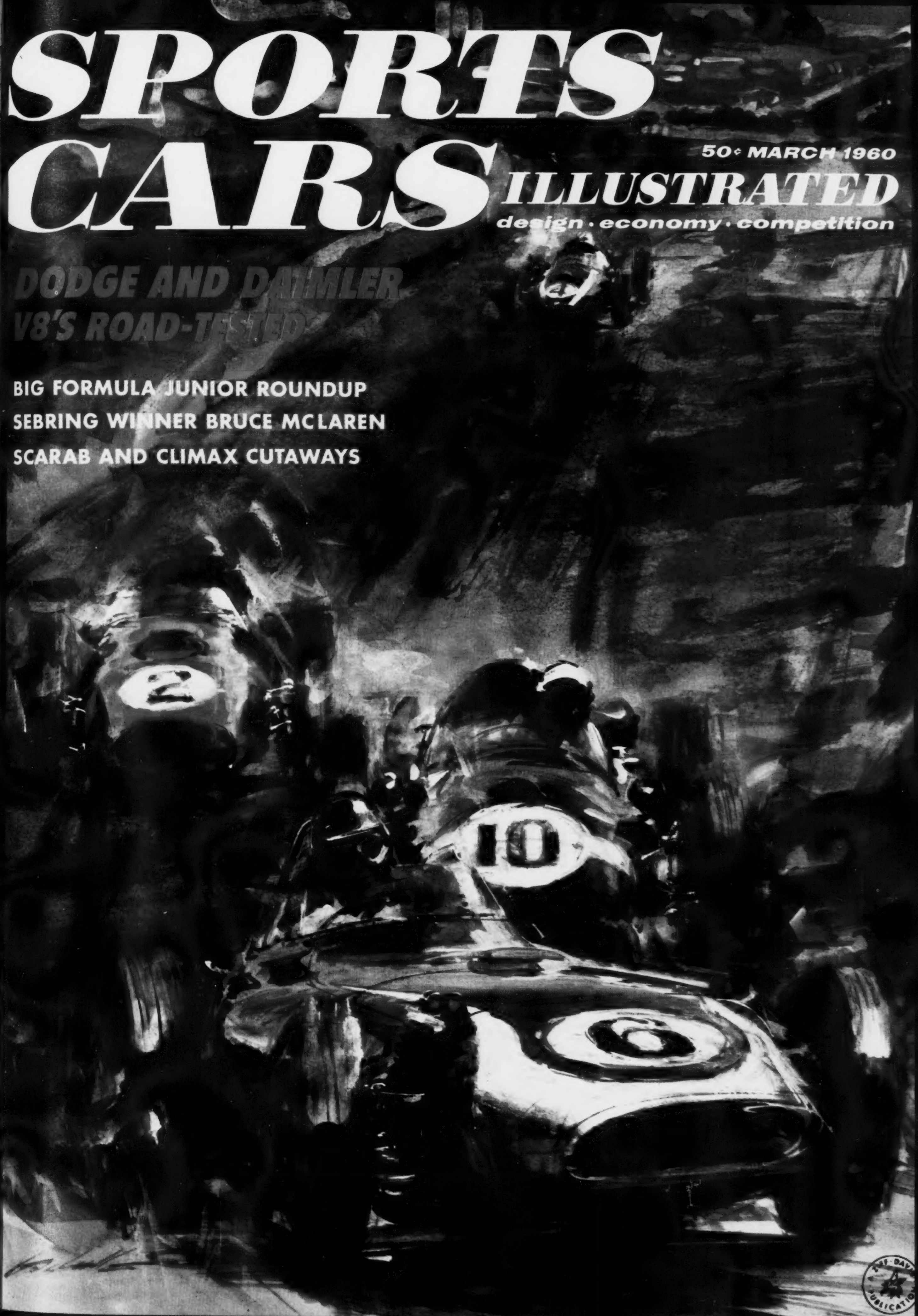
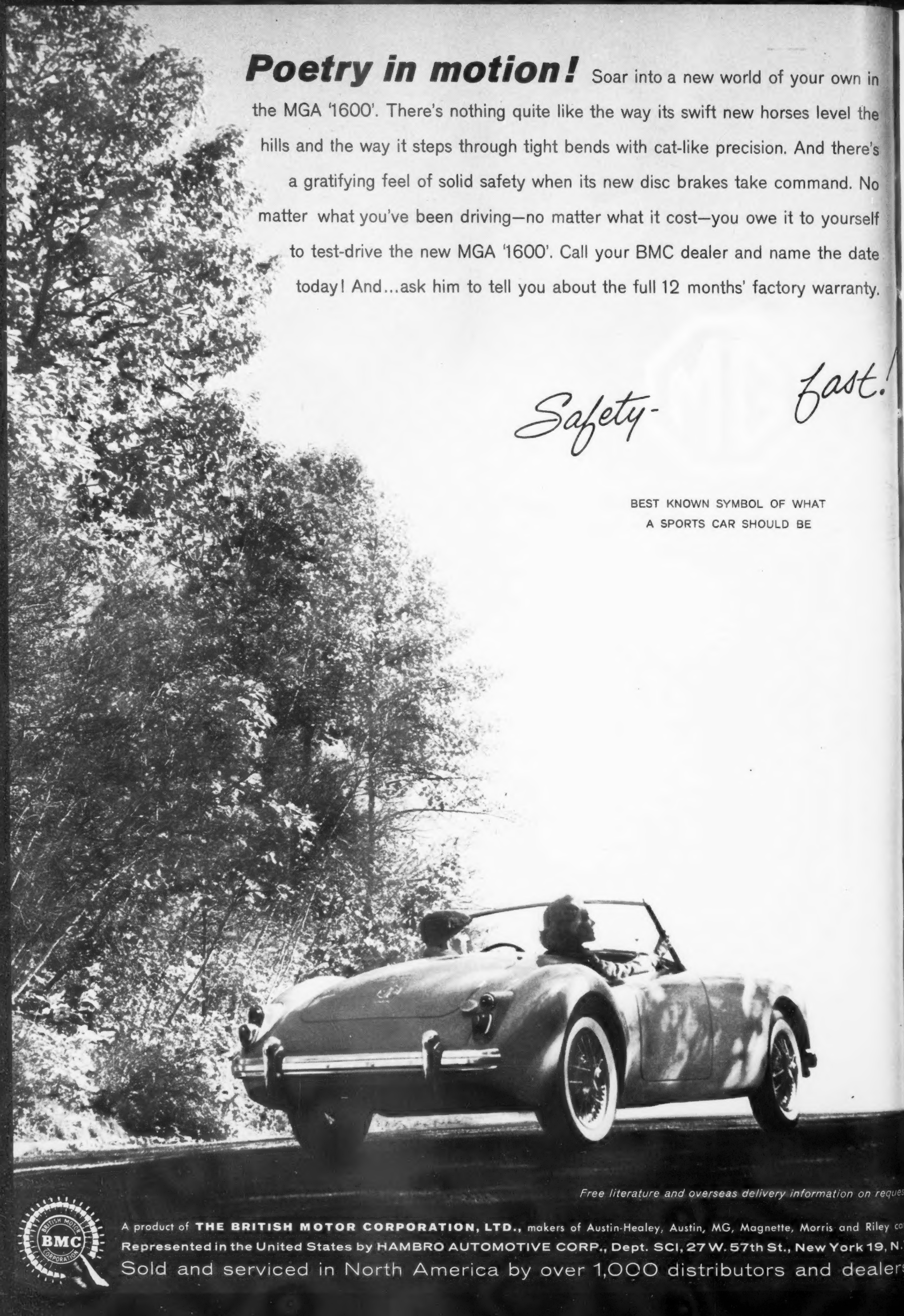

SPORTS CARS ILLUSTRATED
50¢ MARCH 1960
design · economy · competition
DODGE AND DAIMLER V8'S ROAD-TESTED
BIG FORMULA JUNIOR ROUNDUP
SEBRING WINNER BRUCE MCLAREN
SCARAB AND CLIMAX CUTAWAYS
ZIFF-DAVIS PUBLICATION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SPORTS CARS ILLUSTRATED

design · economy · competition

MARCH, 1960
VOL. 5 NO. 9

road research report

road tests

men and cars

special formula junior section

features

technical

competition

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Our cover's scene of 1960 Grand Prize racing takes place on Germany's Solitude circuit, in the mind of incomparable artist Walter Gotschke.

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OBSERVATION AND OPINION

► This month there's a lot of Grand Prize coverage in SCI. Partly it's in honor of the first major G.P. event to be held in America in recent years, and of the young man who won it and the engine that powered him. It's also concerned with the way racing is done. There are debates and discussions on the future Formula 1 and on a possible Formula 2, and on Formula Junior in America. Looking back are impressions of Mercedes-Benz Grand Prize cars and forward is an analysis of the challenge of road racing with gas turbines. This kind of racing is in a state of flux today and, now that it's come to America, it's in a position to grow in this country and, we hope, become more familiar to more Americans. Which brings up another point.

What was the phrase I used above? "Grand Prize." Beginning with this appropriate issue, SCI will henceforth use these words to refer to formula-governed single-seater road racing, the brand known as "Grand Prix" in the past. Now that G.P. racing has come to America, and threatens to mature in this country, it's time to be honest with this much-used term. To be sure Grand Prize racing was invented by the French, whose term for it was adopted verbatim by the English—from whom we have inherited most of our road racing traditions. Yet all other countries use their native tongues to describe this kind of racing. There's the *Gran Premio d'Italia, Grande Premio de Portugal, Grosser Preis von Deutschland, Grand Prix de l'A.C.F.,* and the *Grote Prijs van Nederland,* among many others. Now's the time for us to uphold our own traditions and use a term that's based more on reality than snobbery. Hence :"The Grand Prize of America."

Yes, there is sound tradition behind this change. When the sport was still young a series of 400-mile road races was run off in this country; some were to international rules, some not. In 1908, 1910 and 1911 they were held at Savannah, and the event moved to Milwaukee in 1912, to Santa Monica in 1914, to San Francisco in 1915 and back to Santa Monica for the last such race in 1916. From 1911 on these were all held in conjunction with the contests for the Vanderbilt Cup, which were shorter races to different rules. Each of these 400-mile events was called the American Grand Prize—a classic name for a classic event, which was the direct ancestor of December's Formula 1 race at Sebring.

Thus SCI alters its policy for two reasons: to align itself with the practice of the majority of nations, and to carry on a worthy tradition. As more and more Americans become acquainted with Grand Prize racing, these considerations become increasingly crucial.

Just as crucial is the future fate of our American Grand Prize. Everyone of authority in G.P. racing was delighted, last December, that America had finally managed to put on a Grand Prize, but equally disappointed that it had to take place at Sebring—probably the least attractive and poorest equipped major track in the world. We must do better in the future. There'll be a chance for improvement if those in charge at Indianapolis will relinquish their international race date and turn it over to Charles Moran's committee to be reassigned to another track—perhaps Riverside, as a starter.

Driving experiences placed a couple of bees under the editorial bonnet during the past month. First is this business of seat adjustment. What can it possibly cost to make a seat adjustment rack a few inches longer? Is it too much to ask that automobile seats be allowed to move back far enough to accommodate the median 90 percent of the population, instead of just the middle 60 or so? I can see where there might be technical obstacles in the construction of some two-seater sports cars (even there they should be overcome before the cars go to market) but on a four-door sedan it's unforgiveable. Surely even in England and France tall men like to sit comfortably while they drive. Any more test cars that cause trouble on this point will be dismantled by the SCI technical staff and buried 'neath the Pendine Sands.

Second, during the first light snowfall here in New York it was dismaying to see how many cars, American and foreign alike, were immobilized by spinning right rear wheels on the slightest of slopes. With a limited-slip differential (not to mention better weight distribution) on my own car, I got around as if nothing had happened. Thanks to the work of a Mr. Thornton, most axle manufacturers today have access to patents which describe simple and effective limited-slip differential mechanisms. It's time to recognize their importance to road safety and traffic flow, and make such differentials standard equipment.

Karl E. Ludvigsen

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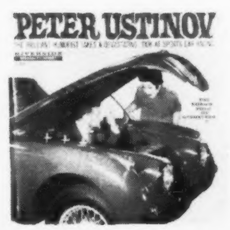

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DETROIT NEWSLETTER

by Mike Davis

► There are other goodies from Detroit besides compact cars which should stir the SCI reader to renewed domestic interest.

Chrysler's new 300 F goes further toward whetting the speed buff's appetite than anything from the mecca of motordom since the Corvette. On top of that, we think it will be the closest to a U. S. sports classic since the demise of the Cord in 1937. Sure, the Lincoln Continental had the special flavor and limited production; Cadillac's present series of Eldorado Broughams certainly combine selective price with limited output and modified styling, and the Mark II Continental was high-priced and distinctive. But none of these also offered performance markedly superior to the standard models.

The 300 F, however, is the most distinctive model of the 300 family's six years, by both mechanical and styling standards. Consider:

- Four-speed synchromesh Pont-a-Mousson gearbox
- 400 horsepower
- Ram Induction
- Spring rates stiffer by 40 percent front and 50 percent rear
- Distinctive grille, louvered hood, special side trim and deck
- Instrument console a la Thunderbird.

To be sure, this is no family car. Nor is it an executive's town car. And no well-heeled dowager or society matron would know what to do with it.

Standard equipment on the limited-production 300 F is Chrysler's three-speed torque converter automatic transmission with the 413 cubic inch, 375 horsepower (at 5000 rpm) mill. The four-speed box and 400 bhp (at 5200) package is optional at extra cost in *very* limited production . . . the 4-speed selector is located in the control console between the front seats (which, naturally, are Chrysler's swivel type) . Also standard is power steering, with a 15.7 ratio.

Red, gun-metal gray and ivory 300 F two-door hardtops and convertibles went on sale in Chrysler dealerships January 15. Prices, by the time all is said and done—options and delivery—will be in the $6,000 area.

Here are some essential ratios for those interested:

Automatic transmission, over-all torque multiplication, 5.39; first gear, 2.45; second, 1.45. Manual, first gear, 3.35; second, 1.96; third, 1.36; fourth, 1.00; reverse, 3.11. Rear axle, both stick and auto, 3.31; optional ratios for both, 2.93; 3.15; 3.23; 3.54; and 3.73.

Carbs are two 4-barrel, downdraft; gas tank holds 23 U. S. gallons; brakes are vacuum power-assisted with 251 sq. in. of area; shocks are heavy duty, and tires are 9.00 x 14 nylon racing type.

We drove a new 300 over a sedate weekend. Except for the louvers in the hood, leather-over-foam-rubber bucket seats, and the console between the seats—containing

tach, window controls, ash tray and a folding armrest with interior compartment—you'd think you were tooling along in just another Chrysler.

UNTIL the deep-throated roar of the ram induction cuts in, blower-like, as you floor the accelerator. Believe us, this isn't a Golden Lion, it's a tiger.

NEW BODY OFFERINGS FOR THE COMPACTS

Leading the parade of new body styles for Detroit's compacts is Corvair's two-door model. Some Corvair enthusiasts were disappointed the two-door wasn't more Karmann-Ghia-ish or Caravelle-y. But remember, the two-door Corvair costs $50 less than the four-door, not $700 more. And, like the Valiant wagon, other body styles have to derive from the basic design because of mass production manufacturing costs.

Next is Falcon's two-door wagon. It is unlikely that Ford will offer a four-door wagon in the Falcon since the Mercury Comet, due later this month, will have such a body style.

Standard rear axle ratio on the wagon is 3.56, with an optional 3.89 available. The sedan, by contrast, has 3.10 standard and 3.56 optional, although this might be reversed because of complaints about low power with the more economical 3.10 ratio.

One neat aspect of the Falcon wagon is the tail-gate. Note that the window cranks down into the gate, rather than swinging skyward as in other Ford wagons.

JUST OVER THE HORIZON

Warmed—you might even say fired—by the public response to the new Detroit compacts in the showrooms, the Big Three are hastening to bring out even more new models.

Up until actual introduction, auto company execs had great misgivings about the market. Some are still dragging their feet. But generally, as floodgates of customer enthusiasm overflowed, go-aheads were given for additional body styles.

Ford announced from the very first its intention to market a pick-up truck, or Ranchero, version of the Falcon. This model should be out in the next month or so.

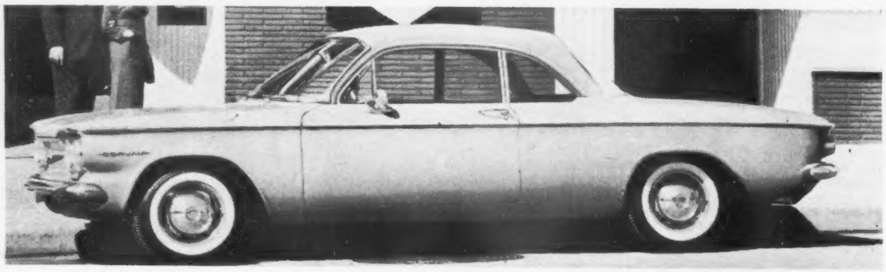
The Motor City grapevine also reports that Valiant is considering putting on sale both a convertible and two-door wagon. Ford, with its long love of convertibles, could as well be considering a Falcon rag-top. And Chevrolet is hard at work on its Corvair station wagon and small truck.

At this writing, it is not possible to predict whether these models—if finalized—will appear before the 1961 model year. And don't forget that these are in addition to the Comet, BOP and perhaps additional Chrysler economy car offerings in the next few months.

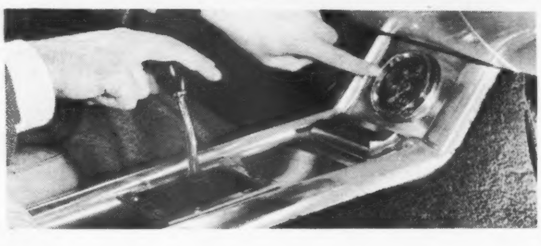
BEYOND THAT HORIZON

Some dope on the 1961 models is beginning to leak—or be leaked—out. There are Rambler's aluminum engine and convertible. Chrysler's new slanted six will go to the light metal, also.

With the aluminized Corvair and BOP, this will leave Ford Motor Co. and Studebaker-Packard without aluminum blocks in their lineup. Ford, though, will get its first in 1962.



New to the modest-sized car market, Ford's Comet (top) will come in four body styles including this station wagon. Looking disappointingly like the four-door, the Corvair Coupe costs $50 less than its many-doored sister. Future Ford Falcon buyers will be offered this station wagon body (right). Chrysler's 300 F comes with console-mounted stick shift and tach (bottom).



Hurrying to get on the compact car bandwagon, Ford's Lincoln-Mercury Div. advanced the public announcement date of the new Comet to early February.

As we described it in the January Newsletter, the Comet is built up from the Falcon body: 114 inch wheelbase, 194.9 inch overall length, 70.4 inches wide and 54.5 inches high (the last two dimensions are identical with Falcon).

At this writing, the power plant is also the same as Falcon—oversquare, 144.3 cu. in., 90 h.p. at 4200 rpm, six cylinder in line overhead valve, cast iron block. However, since the Comet weighs about 120 lbs. more than Falcon, there are rumors the stroke will be increased slightly, yielding perhaps 170 cu.in. displacement.

With the increased length, turning circle of the Comet is 39.3 feet, about that of the Corvair. Steering ratio remains slow—like the Falcon—with 4.6 turns lock to lock "to give the driver a steering feel comparable to a standard American car and eliminate the need for acquiring new driving habits."

Ford is coy about what size it will call the Comet. (Most auto writers are similarly puzzled—any ideas?) Background material points out that it "is not a small car . . . not a large car, nor is it a compact car in the usual sense of the word." Of course, from 1941 to 1951, standard Fords had the same wheelbase.

Perhaps mindful of its optimism about sales volume of the late lamented Edsel, the company is also cautious about either production or sales estimates. Initially, Comets will be produced at Lorain, Ohio, one of three plants now turning out Falcons.

The decision to bring out the Comet was made in 1958 and Ford is definitely aiming at the style-conscious carriage trade. By adding four-and-a-half inches to the wheelbase and about a foot overall, George Walker's designers were able to produce a better-balanced car, much in the Detroit tradition.

Above the belt line, the added length made possible a greenhouse like the Galaxie or T-Bird, which has had an excellent reception. The two-door model looks much like a hard-top, quite different from the utilitarian Falcon Tudor. Inside, the fabrics and trim match Mercury's best. A fancier instrument panel is featured. And more luggage space—26.6 cu.ft.—with a better ride than that of imports or smaller U.S. compacts.

Ford believes that the female of the species will be drawn to the "shorter wheelbase" cars by their maneuverability and parking ease. Mercury dealers will get a toe—and perhaps a whole foot—in the lady's door with the more highly styled and luxurious Comet. Economy and ease of maintenance should also appeal to the breadwinner.

Comet will be produced in four body styles, two and four door sedans and station wagons. Air conditioning is offered as a regular production option. Prices have not been released, but our guess is an advertised delivered price for a Fordor of $2,075—just a shade over Valiant and a few bucks under the Rambler 6.

—md


THE
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WOMEN
IN HIS
LIFE...

The Rover 3-Litre Sedan has been designed to give many years of swift, silent, trouble-free motoring with exceptional accommodation for the comfort and convenience of driver and passengers. A detailed appreciation of the Rover 3-Litre from Road & Track Magazine may be had by writing to:

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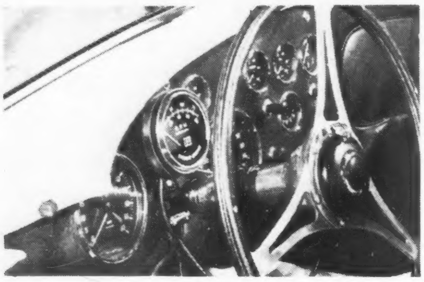
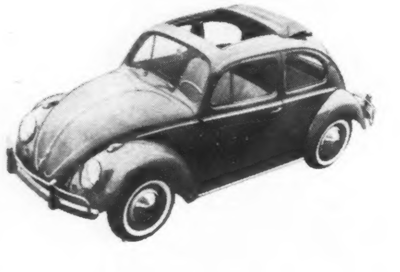
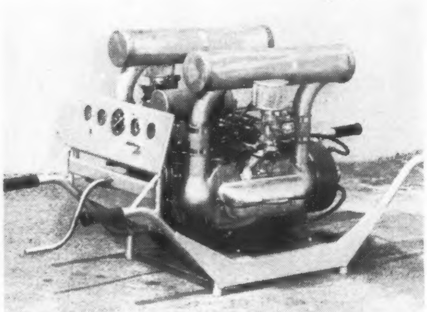
PIPELINE



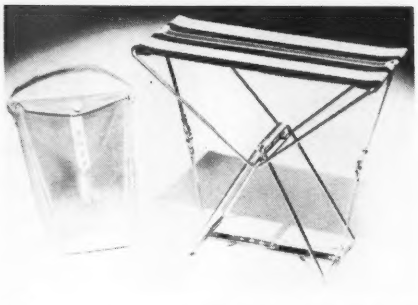
Stewart-Warner has recently announced a new line of electric tachometers. Called the "100" Series, the new instruments are available for either 6 or 12-volt ignition systems. They can be used on 4, 6 and 8-cylinder engines. A tuned circuit in the sender assures accuracy of engine speed reading up and down the rev range. Dial faces reading 0-5000, 0-6000 and 0-8000 are available to fit the new tach to your installation. Information can be had by writing to the Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago, Ill.



The only model VW that has received the factory seal of approval, the Pyro plastic VW kit comes complete with battery-driven motor for $1.98. Kits are available from Hobby City, 148 West 22nd Street, New York, N. Y.

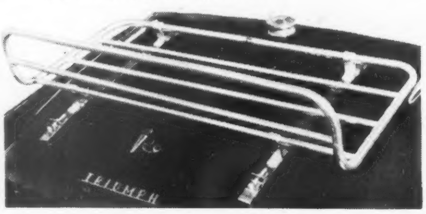


Fletcher Aviation Corporation recently announced production of a self-contained air-cooled engine intended for all applications that require a light, compact power source. Patterned after the Porsche engine, it incorporates a fanless cooling system that utilizes the exhaust stream to move cooling air around the cylinder heads. The new Flair engine will operate on a stationary stand at full power indefinitely without overheating. With a weight of 185 pounds, and a horsepower rating of 65 bhp the Flair's power to weight ratio is one to three. Present stationary power plants have a one to five or heavier power to weight ratio.



Spectate at your next sports car race in comfort with a light-weight folding seat. Built of steel tubing, with a heavy canvas seat it will support the heaviest enthusiast. Folded it fits into a 7-inch by 9-inch vinyl carrying case. Send $2.75 to The Crosswinds House, Dept. SI, #1 Crosswinds, St. Louis 32, Mo.

Scratch Out, a new product recently introduced by The Bucket Shop, removes surface scratches from plexiglas racing shields, plastic side curtains, wind wings, and plexiglas back windows. Packaged in half-pint cans, Scratch Out sells for $2 and is available from the Bucket Seat, 30 Charles Street, New York 14, N. Y.



A combination luggage-ski rack designed for use on open sports cars is being produced by Baker's Worldwide Auto Parts. Made of aluminum tubing, the rack features a novel mounting system that eliminates the need for drilling holes in the bodywork. For more information write, Baker's, 1073 Hempstead Turnpike, Franklin Square, Long Island, New York.

A recently published pocket-sized book offers—in unornamented language—useful information on motoring in 16 different countries. This 132-page book includes currency conversion tables, best routes, comparative clothing sizes US, English, Continental, shopping hints for each country, and mileage tables. A copy of this helpful volume can be had by sending $2 to E. S. Lee, P. O. Box 5505, Daytona Beach, Fla.

OOPS DEPARTMENT

Though it's late, we would like to point out that the track diagram of the Aintree course on page 86 of SCI for November, 1959 originated in the book, "Motor Racing Circuits of Europe", which is distributed in the U. S. by the Macmillan Company. Further the photos of the Tyce-Taylor engine in SCI for February, 1960 were by Bob Boxberger.

Now that American rally competitors are fighting for that last fraction of a second this beautiful bronze-finished sun dial will make a thoughtful gift. Just $3.98 from E. Joseph Cossman and Co., 7039 Sunset Boulevard, Hollywood 28, Calif.

SCCA CALENDAR

Just to hand the SCCA National Rally and Race Calendars. Naturally, dates are not confirmed in this early listing.

RALLIES

March 26-27	Texas Region
April 7-10	North New Jersey Region (Jersey 500)
April 23-24	Arizona Border Region (Great Canyon)
April 30-May 1	Detroit Region (P. O. R.)
May 20-22	Washington Region (Virginia Reel)
May 21-22	San Francisco Region (Golden West)
June 4-5	Milwaukee Region (On Wisconsin)
June 18-19	Central New York Region (Historic N. Y.)
July 8-10	South Illinois Region (Thirty et Six)
July 15-17	Chicago Region
August 19-21	New England Region (Berkshire)
September 16-18	North East Ohio Region
September 23-25	Colorado Region (Colorado Divide)
October 7-9	New York Region (Rip Van Winkle)
October 21-23	San Jacinto Region (Texas)
November 4-6	Los Angeles Region
November 4-6	Philadelphia Region (Appalachian)

RACES

March 19-20	Midland
April 2-3	Pensacola, Florida
April 15-17	Marlboro, Maryland (President's Cup)
April 30-May 1	VIR
May 14-15	Cumberland, Maryland
May 28-30	Bridgehampton, N. Y.
June 18-19	Elkhart Lake, Wisconsin
July 1-2	Lime Rock (4th rain date)
July 16-17	Continental Divide Raceway, Colorado
August 6-7	Montgomery, New York
August 20-21	Louisville, Kentucky (Kentucky Derby Festival)
September 3-4-5	Thompson, Connecticut
September 10-11	Elkhart Lake, Wisconsin (Elkhart Lake 500)
September 23-24	Watkins Glen, New York
October 29-30	El Paso, Texas
November 12-13	Daytona Beach, Florida

LETTERS

WHY BE SHIFTLESS?

Recently I had the experience of owning a 3.4 Jaguar with automatic transmission and I wish to advise would-be-buyers to consider the issue carefully before accepting the automatic over the standard gear box. The advantage of creeping along in city traffic with a mushy-feeling transmission is a high price to pay for the tremendous advantages offered by the four-speed stick shift in any circumstances you would care to mention. It seems a shame so many 3.4 owners are turning from the velvet-smooth gear box to the automatic for reasons which I cannot quite understand. With only 2,600 miles on the clock I traded my 3.4 for the new Jaguar 3.8 MK II with standard shift—and believe me I'm the happiest man in town! It's like driving my former MGA with the added convenience of more space and of course superior performance.

John D. Walker
Town of Mount Royal
Quebec

PAPER MACHE SPECIAL

I have just finished devouring the January issue of SCI and read with great interest the story of the Paper Mache Special. I would very much like to ask Mr. Walt Martin, the teacher who supervised the project, a few questions on construction details. Could you please send me his address?

My attempts at fiberglass and aluminum have failed miserably and my special looks naked without a body.

Gerald A. Howatt
Chicago, Ill.

Your letter, along with a number of others, has been forwarded to Mr. Martin. Anyone else wanting additional information on the Paper Mache Special can write to:
Mr. Walter Martin
Sunhearth
Roaring Springs, Penna.

SCI WORTH MORE?

I get a kick out of your "hurry up and renew before the subscription rate goes up, etc." blurbs. Are there really people in this wide, wonderful country of ours who are interested enough to subscribe to your fine magazine who would scream at an increase in rate?

In my humble opinion SCI would still be the greatest bargain of its kind at $1 a copy. I frankly don't see how you can put out such a magazine at even the new rates and make a profit. I feel like a kid on Christmas morning each time I find my copy in the mail box. My only criticism is: Why not bi-monthly, at least? I long ago dropped my subscriptions to all similar magazines. (I use the word "similar" loosely, because none of the others faintly resemble SCIs quality in any way.) Keep up the good work.

A. K. Bradford
Westfield, Mass.

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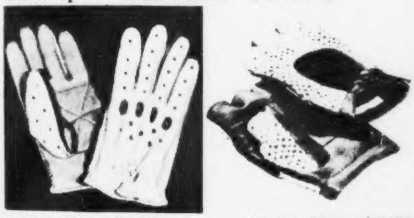

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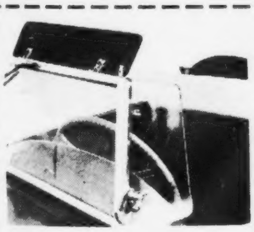

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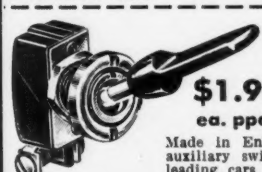

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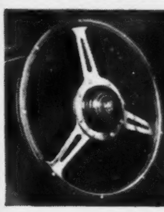

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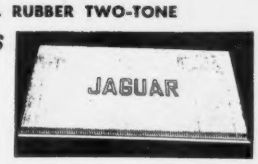

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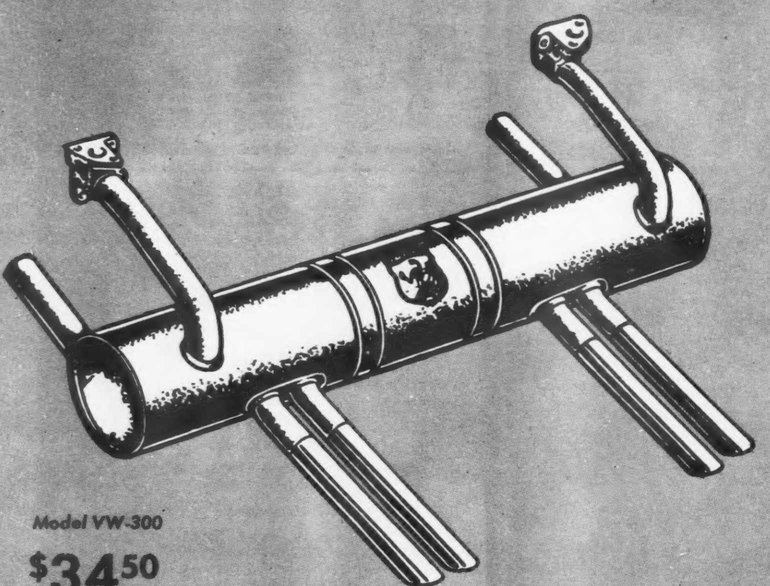

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EUROPEAN NEWSLETTER

▶A rear-engined Formula 1 Lotus is in the works for 1960. Possessing the same weight distribution of the 1959 cars, to give unchanged handling, the new car will use a 1958 Le Mans type gearbox, with a layout similar to that found on Porsche transmissions. Rear engine layout will get back the 25-odd horsepower that has currently been lost by angled transmission shafts.

Ferrari has been experimenting with a Cooper chassis bought from Centro-Sud, using a single camshaft V-6 Dino engine. This is the probable basis for rumors about a rear-engined Ferrari. Dunlop disc brakes will continue to be used by Ferrari in 1960.

Stirling Moss has contracted to drive a Formula II Porsche in 1960. The car and a spare engine has been purchased by Rob Walker's stable. Alf Francis has already spent time at the factory learning the engine.

Dan Gurney has signed with BRM as has Graham Hill.

Work is going ahead with Rob Walker's own car, the "Walker", designed by Colotti, based on the Cooper layout but with refined frame structure.

Mercedes Grand Prize rumors are again rampant; a possible Porsche design backed by Mercedes has been talked about. The story is that the engine is a V12, developing 208 bhp, and that it has lapped the Ring in close to 8 minutes!! People of importance in racing claim to have seen the engine on test at the Porsche works. The BMW stockholders turned down the proposed purchase of the plant by Daimler-Benz.

Rallies have been the thing during the past winter in Great Britain. Both the RAC Rally and the Monte Carlo were followed closely by enthusiasts in England. There are so many English entrants in the Monte that it almost takes on the character of an all British rally.

Perhaps Jacques Taffe will forgive me for referring to his classic event as a British rally, but so highly do the motorists and manufacturers in this island regard the Monte that few dare ignore its reputed publicity value and the industry is annually thrown into a complete hoo-ha as the time for its inception draws near. Weather makes of this rally such a gamble that most manufacturers would gladly turn their attention to an event where a well prepared car and driver were of more importance than a sudden snowfall in the Auvergne, but the whole thing has become the focus of a peculiarly British tradition to the extent that a large and thriving club exists for competitors past and present and 85% of the entry comes from this country.

The RAC Rally, while not the best rally ever, was quite the best that our ruling club have put on and good by any standards: it is a great pity that the result, in abeyance due to a protest by Auto-

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EUROPEAN NEWSLETTER

Union driver Wolfgang Levy, who stands to win the European Touring Championship thereby, will not be known until after the Monte Carlo Rally, which is when the CSI of the FIA have their next meeting. Perhaps the most notable feature of the event was the appearance for the first time of works teams of the revolutionary 1959 models from BMC, Ford, Sunbeam and Triumph. The last named firm, due to their early announcement had already tasted victory by gaining a Coupe des Alpes with a semi-works sponsored Herald Coupe in the hands of "Tiny" Lewis. They drew blood again in the RAC by winning the overall team prize with this model, their sister TR3s being second. Rally mods to the cars are simple and presumably available to all, they consist of strengthened rear radius arms, modified axle ratio where permissible, Burgess silencer, flattened rear spring, raised compression ratio, export radiator and a four bladed fan.

Triumph are not the only concern to put all their eggs in one basket. BMC's baby cars aroused immense enthusiasm among their rally crews, mainly on account of their fantastic roadholding. This was apparent in the numerous speed tests on well known Club circuits, where they were able to make up in cornering power what they had to give away to more potent machinery on the straights. In subsequent events we shall have demonstrated to us the tractive ability of 10″ front wheels with the engine above them and be able to compare them with somewhat larger rear wheels also with the power unit on top.

The new Ford Anglia was not so overwhelming as anticipated in the RAC event but there was little mechanical bother and Anne Hall was able to take away the Ladies Prize. In the speed tests it was observed that although these cars would go into a corner as fast as the Heralds against which they were matched, they would come out more slowly due to slowing down on their understeer. Someone has already remarked that however fast one takes the car into a corner it comes out at 45 mph, no more, no less. Even if this is a truism there is no doubt that this is a car which lets fools off lightly.

Our own transport for the RAC was the family Mini-Minor, filched from the eager hands of Mum for the occasion and temporarily converted into the likeness of a rally car by fitting a cornering light and removing the air filter, the latter mod having the reverse of the desired effect by reducing the maximum by almost 10 mph. Travelling on streaming wet Highland roads in the depths of night we were able to observe that an accompanying Minor 1000, well driven and fitted with Dunlop Durabands, had to use all the road to cruise at our speed while we were able to keep inside the white line . . . and the law.

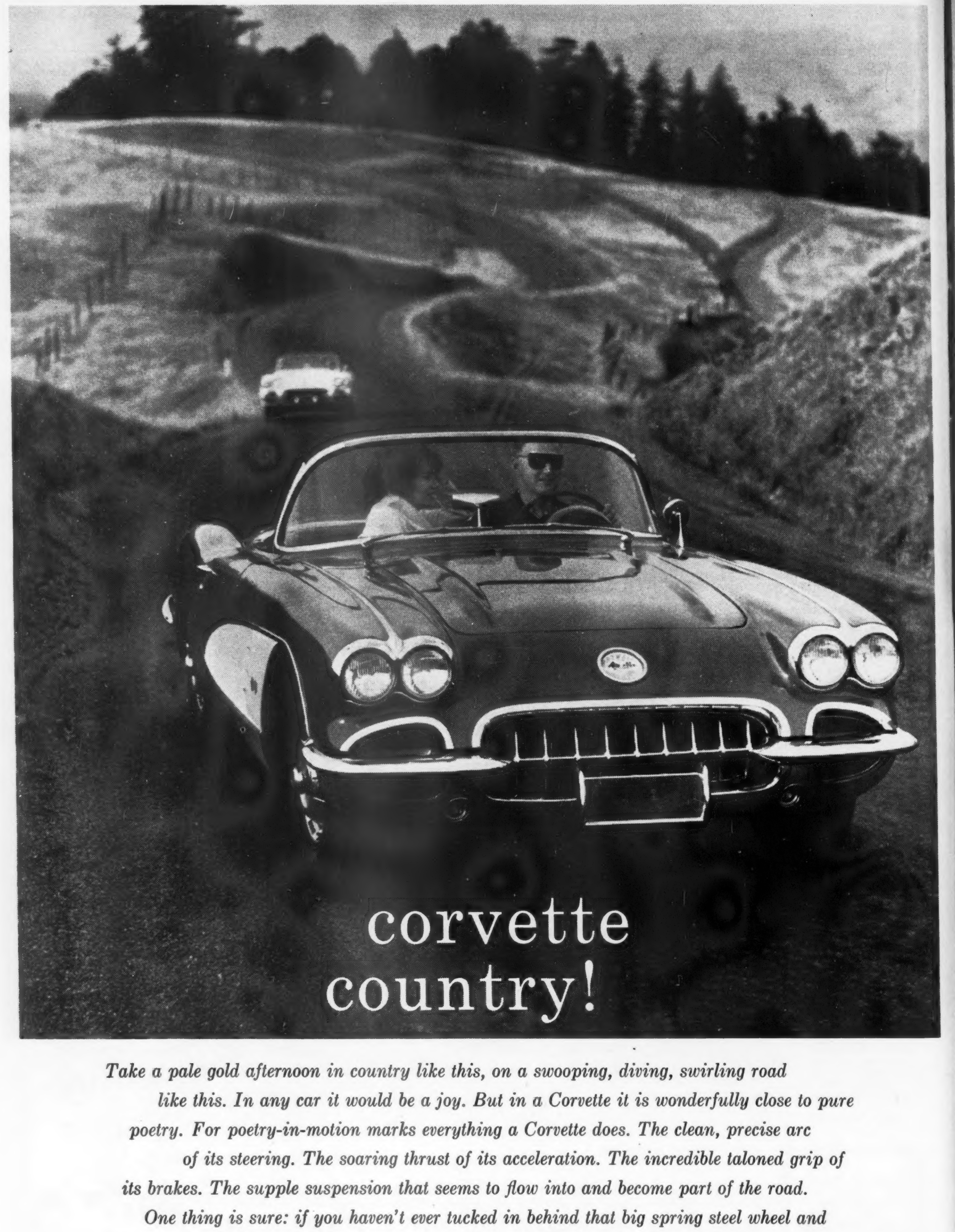
For Dunlop's competition department, rallies are almost as big a headache as the races. As part of their duty to keep the customer on the icy road they are producing a special Duraband — their steel cord tire — with tungsten carbide tipped studs inserted in the tread. This French idea, instigated by a M. Maillard, was a great help to the winning Renault Dauphine in 1958, applied to Michelin X tires. Dunlop tried the same idea last year, applied to their Weathermaster cover but had a number of failures due to their studs being too large and overheating when the drivers had perforce to negotiate quite short stretches of dry road at speed. Also lacking was the bracing effect of the steel cord. In addition to the work of studding, which is a hand process and costs up to $30 per tire, the Dunlop special shop had a problem on hand stocking up the motor-racing circus with their new R5/D9 cover, introduced for the Oulton Gold Cup Race. This tire has no sidewall rubber and a flattened cross-section, features said to be worth nearly two seconds a lap at Oulton.

We were recently privileged to enter the hallowed and forbidden precincts of the Special Shop, suitably situated at Fort Dunlop. Here, in an atmosphere of peace and unhurried craftsmanship were being made the covers which have shod the first three cars in every Grande Epreuve this year. Despite the apparently leisurely pace and the immense care at every stage of manufacture, 13,000 racing tires have been produced this year. It is encouraging to discover that the inspection department admits of no tolerances; any cover not perfect is destroyed. Currently in hand are the tires for Donald Campbell's Land Speed record car and test running will be carried out in the new high-speed test house, an underground establishment heavily lined with concrete and featuring closed circuit television to observe every aspect of the tires' behaviour. Strangely enough Dunlop do not rate this problem so highly as the design of road racing tires. Having "tired" practically every Land Speed record holder in the last quarter century they have enough data on the files to render proving of these new tires a simple test house procedure.

Technical journalists recently had revealed to them a display of multi-fuel engines at the War Department's Chobham establishment. The most powerful of these units, a Leyland, supercharged, opposed piston, two stroke developing 700 bhp had as a starting device none other than a miniature three cylinder, opposed piston blown engine to match, produced by our old friends Coventry Climax. Torque and horsepower figures for this engine are eagerly awaited.

The robustness and easy shifting of the gearbox on the new Ford Anglia 105E has attracted much attention and there is no doubt already a queue of special builders for this blocker ring synchro box. It is interesting to ponder that this box must have the shortest linkage of any box of this type, most of which appear on rear-engined cars or are commanded by steering column levers.

Technical progress, hailed by some, is not always so apparent to the uninitiated. Many old Ford owners are bewailing the passing of the old side valve, whose low speed torque made a three speed gearbox possible and gearchanging an infrequent necessity; to these people a fourth speed is just one more cog to be swapped, a necessity with the relatively low torque short stroke engine. *—sci*


corvette
country!

That 1961 Formula

In late October of 1958 a decision was made on a new Grand Prize formula to be effective at the beginning of the 1961 season. Perhaps like no formula before, these rules have touched off a raging controversy that shows few signs of abating. What are they? They read as follows: "From January 1st, 1961, Formula 1 shall be for cars with a cylinder capacity of from 1300 to 1500 cc unsupercharged, running on commercial fuel. A number of other devices will also be compulsory. These are: 1. a protective roll-over bar; 2. an automatic starter; 3. a double braking system — one working on all four wheels and an emergency system working on at least two front wheels; 4. no replenishment of oil to be allowed during a race; 5. "safety-type" fuel tanks; 6. driver's cockpit to be open and all wheels exposed; 7. cars to have a minimum weight, including oil and water but without fuel, of 500 kilograms (1102 pounds), this weight not to be made up by ballast." SCI has asked two experts, each with an active and practical interest in motor racing, to give this formula a thorough going-over. Deeply opposed to it is Stirling Moss, whose sincere and professional attitude toward the sport doesn't need underlining here. Just as deeply in favor of the formula is Richard von Frankenberg, who brings to bear years of experience with 1500 cc racing and a sympathetic view of the European Grand Prix situation. Immensely successful at pushing Porsches, he has worked for the Stuttgart factory and is now Sports Editor of the German journal DAS AUTO.

WEITMANN

FOR by Richard von Frankenberg

► Racing formulas aren't pulled out of thin air. They're devised by the "Commission Sportive Internationale" of the F.I.A., the ultimate international authority in motor racing. In this commission are seated all the representatives of those countries that are involved in automobile sport in some way –thus not only those countries which actually build racing cars, but also those which organize great racing events without possessing racing cars. Remember that countries like Belgium, Holland and Portugal sponsor Grand Prize races for Formula 1 cars without ever having built such cars. Before these national representatives meet in Paris to present and attempt to co-ordinate their concepts of new racing formulas, they've conferred at home with the automobile clubs–the race organizers–and with technical authorities to settle on an "order of march" for the F.I.A. discussions.

When a new formula is being shaped the members of the C.S.I. are duty bound to keep three key issues in mind: First, a new formula must pose new problems for the designers–problems whose solutions will be of some use to the further development of the automobile. Second, it should be possible for a large number of firms to participate in the races according to the new formula without an excessive financial burden. Third, the framework of a new formula should embrace exciting dices on the track for the benefit of the public. We mustn't forget that a promoter can not organize a Grand Prize without spectator support.

The present Grand Prize formula has been in effect since the beginning of 1954. It was originally planned to run four years but was lengthened, with the addition of a restriction

(Continued on page 72)

AGAINST by Stirling Moss

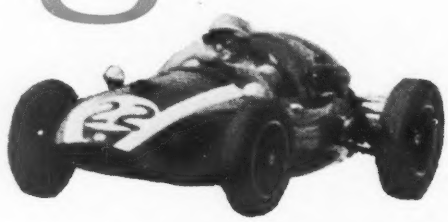
► January first, 1961 to me will mark the greatest backward step in racing that will have happened since I have been in competitive motoring. The F.I.A. has decided to cut the Formula 1 limit down to 1500 cc and to impose a minimum weight of 500 kilograms. This is, to us, 1100 pounds. This has been ill-received not only in England but in Italy, and, I think, in America as well. I have yet to meet a driver who races, even fairly frequently, who considers that it is a good step. This also holds good for constructors and, in most cases, circuit owners.

To build a car to this new formula is going to be far more expensive than I think most people realize, because it will not be possible to modify the cars we have today and get away with it. It will really mean starting with a clean sheet of paper and an entirely new design, and I should think that the most successful cars will have more than four cylinders. To give some indication of how ridiculous this minimum weight is I would like to point out that the present-day Formula 1 Cooper, which delivers something around 240 bhp and is currently racing against the Ferraris, only weighs about 1000 pounds while its smaller 1500 cc brother is about 150 pounds lighter than this. So far, both types of Cooper have had remarkably few structural failures, yet the F.I.A. feel that it is necessary to add two or three hundred pounds in weight if we are going to use the same size engine as today's Formula 2.

They have suggested that it is safer and will also be interesting to the public. Personally, I feel that the new formula is going to be uninteresting for the public because

(Continued on page 72)

THE COOPER COOP'S FAST FLEDGLING



At 22, Bruce Leslie McLaren, son of a racing driver,

is rapidly putting New Zealand on the European racing map.

by Dennis May

McLaren at rest (left), and McLaren at speed (above). Young Bruce is at work on the type of circuit he likes best, twisty Oulton Park.

► Opportunity knocked for New Zealander Bruce McLaren, albeit inaudibly, the day he signed an entry blank for the 1958 German Grand Prize. This was a qualifying event for the AUTOCAR's F2 drivers' championship—as long as at least six eligibles made the lineup. Only twenty years of age, with previous European race experience that was measurable in months rather than years, and well supplied with the "Who? Me?" diffidence the young occasionally show *vis-à-vis* their seniors, McLaren, left to himself, would probably have passed. He wasn't left to himself, though. Ian Burgess, who knew there'd be five F2 men at the Nürburgring but wasn't too sure of six, jollied him into entering. In second place on the AUTOCAR score chart, as he then was, Burgess obviously had a vested interest in making up a quorum, and if the indispensable sixth man could be a boy rather than a man, preferably unversed in the Ring's notorious sinuosities, why, so much the better.

Although, as it developed, there finally were no less than ten F2 candidates for the *Grosser Preis* starting grid, the Automobilclub von Deutschland showed what they thought of the beardless Bruce by making him reserve driver. Indeed, he was a boy, he'd never even seen the Nürburgring.

Everything panned right until race day, when McLaren, who'd made the reserve-to-runner transition through somebody else's default, won the F2 contest outright, driving his own Cooper Climax. He also placed fifth on general classification, eating the delectable dust of Brooks (Vanwall), Salvadori (works 2.2 Cooper), Trintignant (Rob Walker 2.2 Cooper, and von Trips (works Ferrari). Burgess, on Tommy Atkins' 1.5 Cooper, finished third in the F2 division and dropped to third spot on the AUTOCAR points table. McLaren, on the other hand, bounded clear to the top in the AUTOCAR competition, and ultimately, following the seasonal finale at Casablanca, ranked second to the new champion, Jack Brabham.

More than any other single day's work, it was this Nürburgring performance that put McLaren in line for elevation to Cooper's 1959 works team, hub-*juxta*-hub with the now reigning World Champion, Jack Brabham, and Masten Gregory. The chubby-faced and likeably ingenuous Bruce celebrated his twenty-second birthday on August 30 of last year, making him not only the junior member of the Cooper trio but also the youngest driver on any constructors' team in Grand Prize. In common with Stirling Moss and the late Mike Hawthorn, Stuart Lewis-Evans and Archie Scott-Brown, he is the son of a racing driver.

His precocious skill, it's nice to be able to record, hasn't gone to his head. Back home in New Zealand, when he was taking turns with his father to keep the family Austin-Healey's seat warm in North Island hillclimb and circuit meets, he recalls attempting an impersonation of Moss's celebratedly relaxed driving style. But he'll tell you, without being asked, he's learnt by experience that merely counterfeiting the Moss attitude and making Moss-like faces doesn't make you a Moss in terms of lap times. On the other hand, he adds, actually driving in the wheeltracks and slipstream of the English master is a very salutary exercise indeed.

To illustrate the point he cites last year's British Grand Prix at Aintree, which incidentally, with its several fastish but not too fast right-angle turns, is among his favorite British courses. For the greater part of the race, while out of sight and object-lesson range of Stirling and his BRM, Bruce was, he says, fairly consistently erring on the side of too much selfmade oversteer; the result was that he was far from pretty to watch on corners, in his own eyes anyway and appreciably slower in overall lap times than his subsequent 1'57.0" lap proved him capable of. Then, after a wheelchange stop had temporarily dropped the BRM be-

(Continued on page 74)

All future GP drivers should have understanding fathers. Here, Bruce competes in the Ulster Austin tuned and modified by McLaren senior. It was the first car he drove in competition.

The last car McLaren drove in New Zealand before migrating to England was this 1½-liter sports Cooper. He is shown here in a dusty slide during his run in the Wghangarie Hill Climb.

American Grand Prize

by Jesse Alexander

At top of page a helmeted Jack Brabham passes a few words of advice to Bruce McLaren, who's learning fast. Also seen during practice was a photo of Brabham pasted in Moss's driving mirror, above. Below, Harry Pierce wastes no time unbuttoning Salvadori's retired Cooper-Maserati.

► A true *tour de force* by Alec Ulmann brought America its first look at Grand Prize racing since pre-war Vanderbilt Cup days. Forgetting momentarily that Sebring cannot possibly be considered on a par with well-known European circuits, let's be grateful that an International Formula I event has at last taken place within the continental limits of the USA. Watching Moss knock 20 seconds off his old sports car record and actually being able to get close to a monoposto Ferrari were justification enough for the long trek to Florida. The color and glamor of a Grand Prize had finally arrived in the USA with the weather proving that it doesn't necessarily rain *all* the time at Sebring.

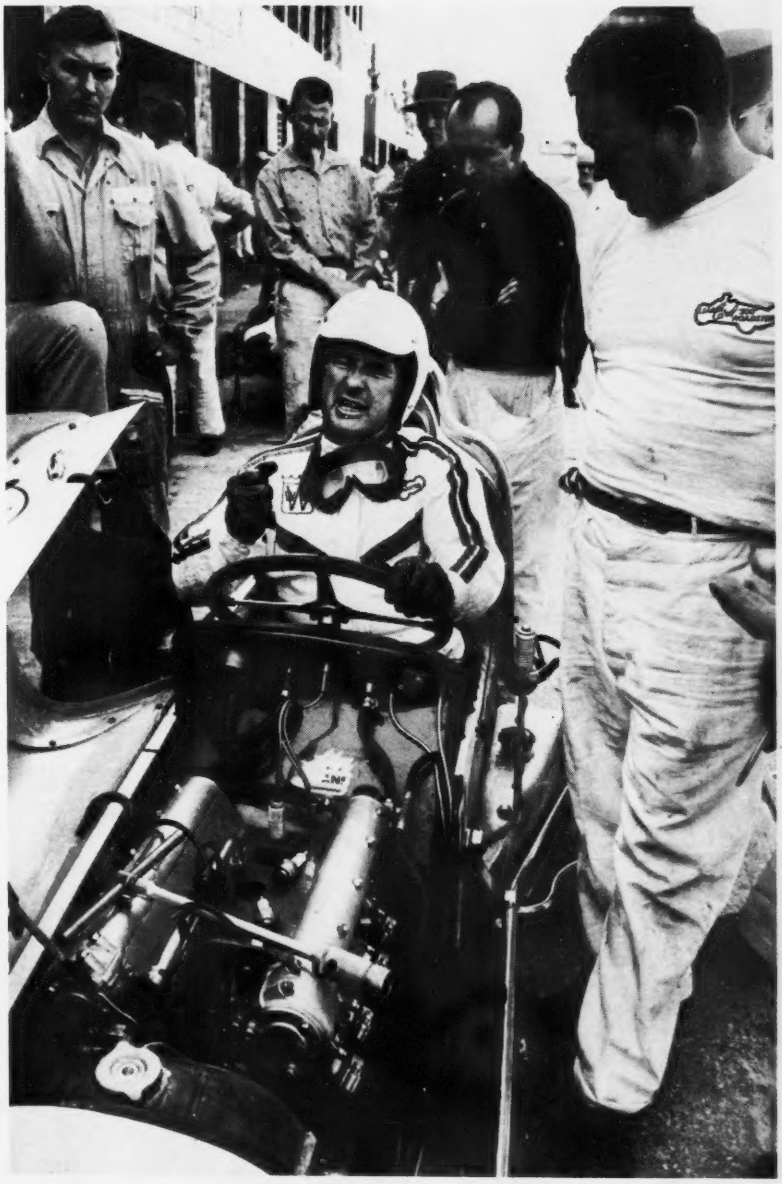
The start of any Formula I event is undoubtedly the most exciting, for new-comers. Sebring was no exception for not only was there the usual last minute hassle with Harry Schell claiming that the timekeepers had done him in, but Stirling Moss demonstrated his usual skill in getting off the mark. He and Brabham accelerated away with the Australian holding a slight edge on initial getaway. Moss, however, regained the lead, and increased it impressively within the first three laps. We shall never know if Stirling planted the seeds of his transmission's destruction during these early laps or not, but after six "giri" the car failed to reappear, having succumbed to gearbox failure.

Moss's early retirement lessened the suspense, but up to then a real battle was in the making with the outcome of the world championship at stake. Earlier, Schell had convinced the timers that he actually turned a quick lap in training, fast enough for his Cooper to replace Brooks's Ferrari on the front row of the starting grid. Its mechanics reluctantly pushed the red car to the second row. Up front Moss held the slot on the extreme left, Brabham in the middle, with Schell now on his right. Maurice Trintignant kept Brooks company in the second row while the third rank consisted of Trips, Allison and Hill, all in Ferraris. Innes Ireland (Lotus), Bruce McLaren (Cooper-Climax), Roy Salvadori (Cooper-Maserati), Alan Stacey (Lotus), Bob Said (Connaught), Alessandro de Tomaso (Cooper-Osca), George Constantine (Cooper-Climax), Harrry Blanchard (Porsche RSK), Frederico O'Orey (Tec-Mec), and Roger Ward (Kurtis-Kraft Offenhauser Midget), made up the remainder of the starting grid.

It was surprising that opera star James Melton dropped the flag rather than the highest ranking national FIA official present, which would have been Charles Moran. But despite this break with tradition, the start was a good one, the pack roaring off noisily, the Ferraris moving up rapidly in an immediate attempt to dog the Coopers. Just before Webster turn, in Harry Schell's own words, "those two went by me like rockets, much too fast to make the approaching corner comfortably." Schell proved correct for Tony Brooks

It was a long push for a tired Brabham as the crowd stood stunned, wondering what effect this would have on his championship.

At right, Rodger Ward gets a point across during practice, while Maurice Trintignant (dark jersey) looks on with skepticism.



The debut of postwar GP racing in the States proved exciting to the knowledgeable, while at the same time less interesting for the uninformed. It was however, a curtain-raiser for bigger and better things to come for both groups.

As the cars are lined up on the grid, straw-hatted John Cooper talks racing with another G.P. car builder: Lance Reventlow.

PHOTOGRAPHY: DOLIN

As all year, Ferrari fortunes were mixed. At right, Wolfgang von Trips chats with Alec Ulmann at finish line after last-lap blowup. After long inactivity Trip's run was impressive. Below, Tavoni looks on at left while Cliff Allison, Phil Hill and Richie Ginther debate a point during practice. Clutch failure dogged Hill and Allison.

Like its Lancia forebears, the Dino Ferrari is started by electric motor from behind. New rear suspension is also visible here.

As he enters the Esses, Jack Brabham cocks the Cooper at an angle and lifts the left front wheel. The car is understeering strongly here.

Seen at the same spot as Brabham, Roger Ward tries a dirt-track slide on asphalt with his Kurtis-Offy. Even Ferraris are lifting wheels now.

with von Trips close behind found himself unable to stop and went straight on; this was either a sheer case of nerves on Brooks's part or he could have skidded on fuel very probably spilled on the course by the leading Coopers. Whatever the cause of the incident, Brooks slightly damaged the Ferrari of von Trips in the process.

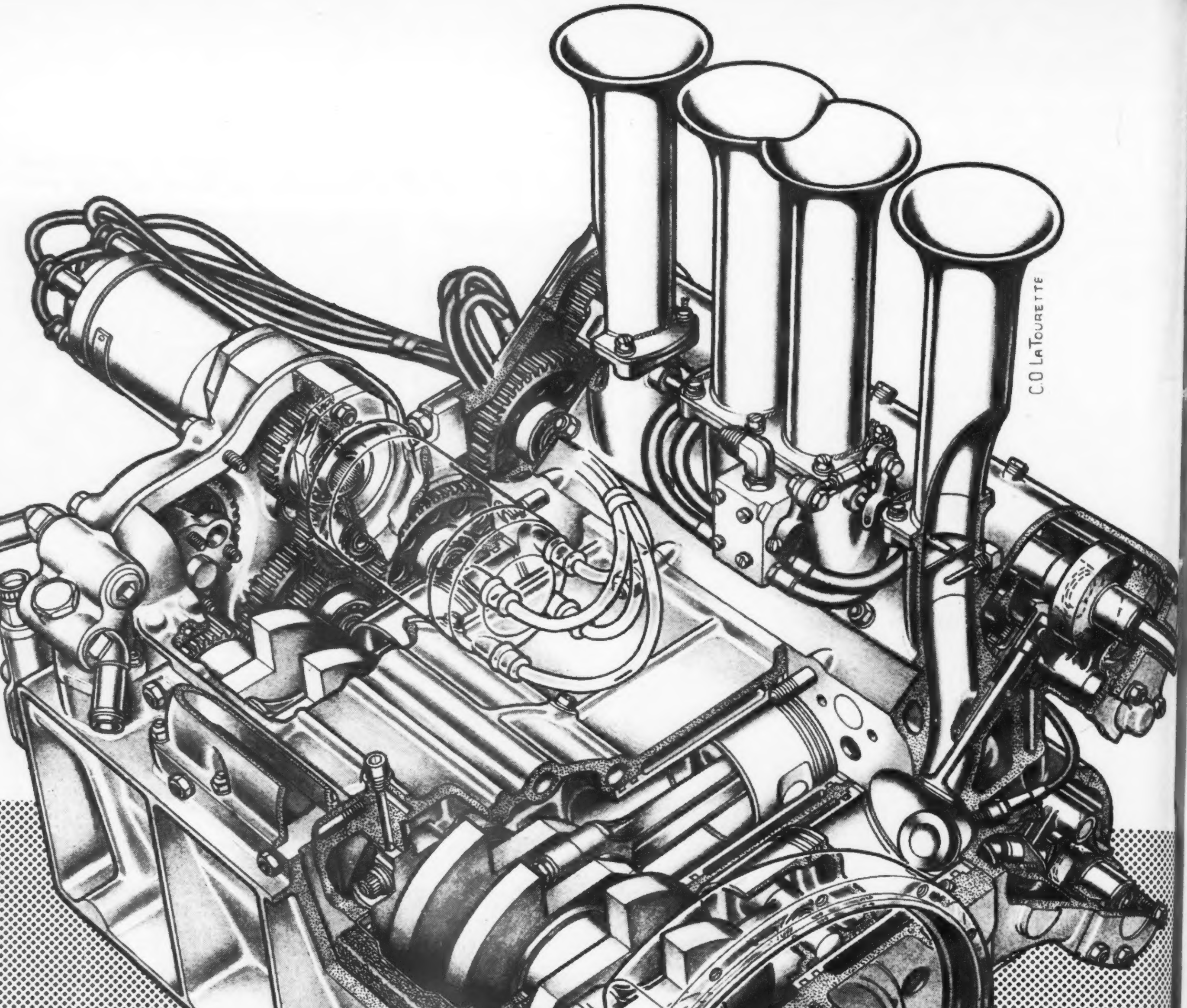
The entire pack roared past, Trips able to stay in control, with the order past the pits on the first lap: Moss, Brabham, McLaren, Hill, Ireland—then von Trips. Brooks somehow restarted his Ferrari without help, pulling into the pits for a brief check of the rear end by the mechanics. Nothing having been bent or damaged, the dentist charged off again. But the stop had been costly, for as later events proved it cost him the championship and changed the entire course of the race.

Stirling Moss turned a 3'06.2" lap while leading, for an average speed of 100.7 mph but once again—for the nth time—it was Stirling's fate to watch from the sidelines while someone else (this time it was Maurice Trintignant) bettered his lap record and then Bruce McLaren took the "checker". Indeed the retirement rate was staggering to the U.S. track racing experts present; cars were continually calling at the pits, some to be pushed to the dead car park, others to be sent back into the fray. Clutch mortality cut down the largest number, including Stacey's Lotus, Ward's Offy, Hill's Ferrari, and Schell's Cooper. Roy Salvadori lost his gearbox and de Tomaso his brakes. The Connaught and Tec Mec also retired early.

Perhaps the most impressive drives were those of Maurice Trintignant and Von Trips, the latter appearing to be at home behind the wheel of the Dino Ferrari, a car he has not driven since the Grand Prize of Italy in 1958. Trintignant also seems to go better when his teammate, Moss, is out of the race. This has happened more than once in the past year. Each time he has impressed everyone not only with his skill but by a cool-headedness that allows him to finish, invariably within the first three places. But the big surprise came at the end of the race. On his final lap, Jack Brabham felt the Cooper-Climax falter and die, the victim of a leaking fuel tank—not more than a quarter mile from the finish line McLaren then moved into the lead; Jack, jumping out of his car and pushing it across the line, was classified fourth overall, retaining the championship crown by virtue of his amassed points.

Technically, the first Grand Prize of America was rich in detail. One Cooper and three Ferraris came to Sebring with completely new rear suspensions, the Italian cars featuring a fully independent parallel wishbone rig similar to both Cooper and Scarab. The fourth Ferrari, painted blue for Phil Hill, retained the de Dion rear end but was powered by a new 2.3-liter single overhead camshaft V-6. The independently sprung Ferraris were obviously easier to throw about than before. Power could be successfully applied on uneven surfaces and the total effect was that of a much better balanced car. Hill's Ferrari was the only one to use 15-inch rear wheels and it's interesting to note that this engine

(Continued on page 88)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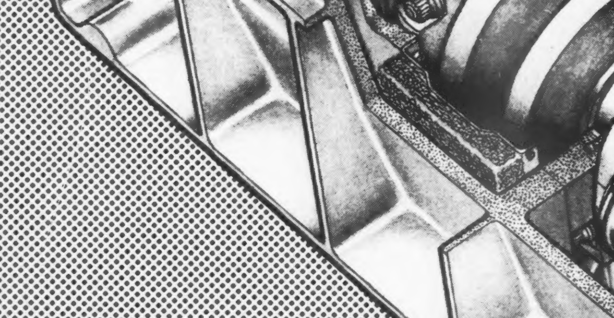
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PROGRESS REPORT

SCARAB FORMULA ONE

BY GRIFF BORGESON

THE ENGINE RUNS AND THE CAR GOES... NOW FOR THE ACTION.

▶ After months of tormenting delays Reventlow Automobiles Inc.'s first Formula I engine was installed on the Traco Engineering dynamometer last November 24. It was cranked over by hand and the fuel and oil lines were bled. The starter was engaged but 12 volts of current wouldn't crank the slightly tight new engine fast enough for it to light. The assembled staff was intent and silent as Frank Coons attached cables to another 12-volt battery. He hit the starter again and this time the dual-overhead desmodromic four-banger leaped into noisy life at a fast idle and everyone's tensions relaxed.

Actually, the engine was surprisingly quiet. Plenty of noise had been anticipated from the desmo valve train and from the gear tower but these hummed below the louder sounds of injector air-intake and dyno gearbox. Travers and Coons cycled the engine, checked adjustments and instruments. Coolant and oil temperatures were up to operating levels and revs were at 6000 when it happened . . . an exhaust valve broke.

It was no fault of the valve or of the desmo train. It was simply that the high thermal expansion of the exhaust valve's stainless steel had been underestimated and insufficient clearance allowed. The lessons of that first test run have been applied to the engine and now, in mid-December, it's back on the dyno again, undergoing the development that should have it ready for the starting grid sometime this spring.

What everyone wants to know, of course, is how closely its output will approximate the estimated, hoped-for 250 to 260 bhp. But peak power readings are something you go after when every element of the engine has been checked and re-checked for correct function and reliability. The first dyno run confirmed the main bearing clearance of .001 to .0015 inch but showed that .002 for the rods was a bit snug and that .003 would be better. The oil passage to the camshafts proved to be a bit small and oil scavenging in the sump required improvement. For the present we can only say that the engine runs and that it seems to run exceedingly well.

That it ran so well from its first revolution is due, to a large extent, to the perfectionist workmanship of Jim Nairn, in whose Culver City shop most of the engine machining was done. Very few changes have been made in the engine which was described in detail in SCI for May, '59. The most important of these few is enlargement of the inlet valve seat from 1.89 to 2.0625 inches. For the present, Hilborn constant-flow injection is being used in preference to the carburetion alternatives. The Lockheed two-plate clutch has been replaced by a similar Borg & Beck assembly.

The engine uses no gaskets and all mating surfaces have a machined fit. A slot is milled in the sump flange to receive a round neoprene seal and each oil and water passage in the head-surface of the block is encircled by a recessed O-ring of neoprene. Circular slots are milled around the cylinder bores to receive hollow, gas-filled copper O-rings. These expand with rising engine temperature and help create a positive seal between block and head. And even the main bearing caps are retained by aircraft nylon-core self-locking nuts which do not require cotter pins.

While sweating out the long, slow process of prototype engine manufacture the RAI staff has been hard at work on chassis development, using one of the new F1 machines and a three-liter Offenhauser engine laid on its side. Although capable of higher output the Offy has been tuned to deliver the maximum expected from the 2½-liter F1 engine: 260 bhp. It weighs about 100 pounds more than the new Scarab power plant and the test car, fuelled and with driver aboard, weighs about 1600 pounds. In this machine Chuck Daigh has accumulated over 1000 fast miles at Riverside Raceway.

The official lap record for that fast course was set in the 1958 LA Times Grand Prix, in a Scarab sports car, at 2:04. Daigh was the driver. During the 1959 installation of the event no one got within shooting distance of this record although machines such as the four-cam 4.1 Ferrari tried.

Daigh's best time around the Riverside course in the Offy monoposto to date is 2:00.9. This was turned with bad brakes and with the car badly out of shape in the turns but sticking like mad thanks to the bite provided by slick-tread tires all around. At present and on patterned Goodyears Daigh can lap the course consistently at 2:02.

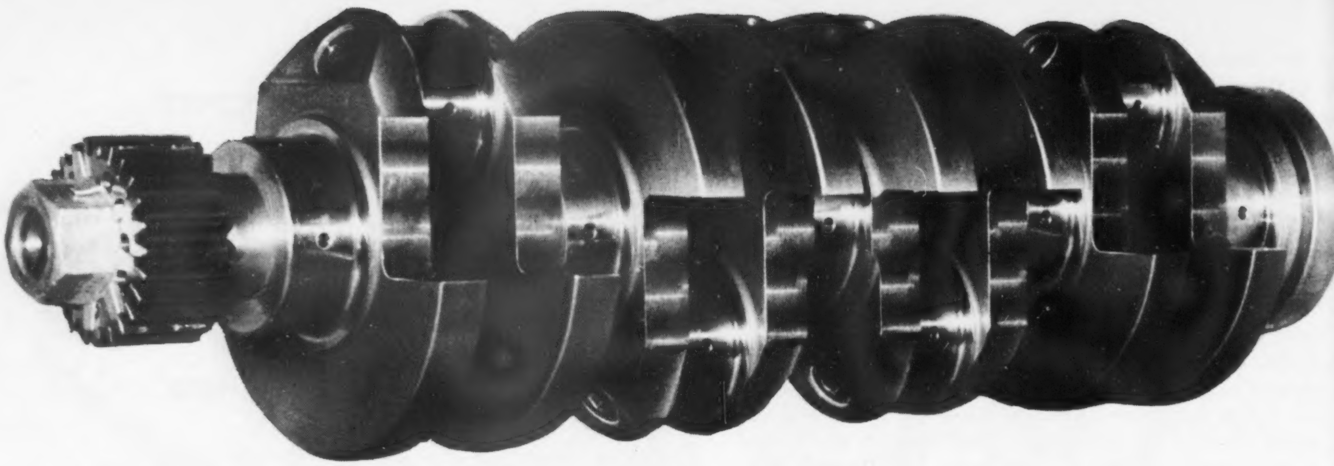
Is this good? No one knows. No other F1 car ever has run at Riverside and we can only go by estimates. If good, well-driven three-liter sports cars – not to mention the more formidable ones – can't begin to approach Daigh's times, maybe the F1 Scarab already shows immense promise. Then there are the Hills and Gurneys who say, "A good F1 car could get around here in 1:55." If they're correct then RAI has a long way to go.

Lap times slightly under two minutes should be possible since the Scarab monoposto still hasn't had a set of useful brakes. The original, single water-cooled brake at the rear worked very well but the expander-tube drum front brakes required pedal pressures that were impossibly high. These finally were abandoned in favor of clutch-type water-cooled disc brakes all around which, at this writing, are being fabricated. As a stopgap measure conventional shoe-type brakes are being used on the test car but they provide very inferior stopping power.

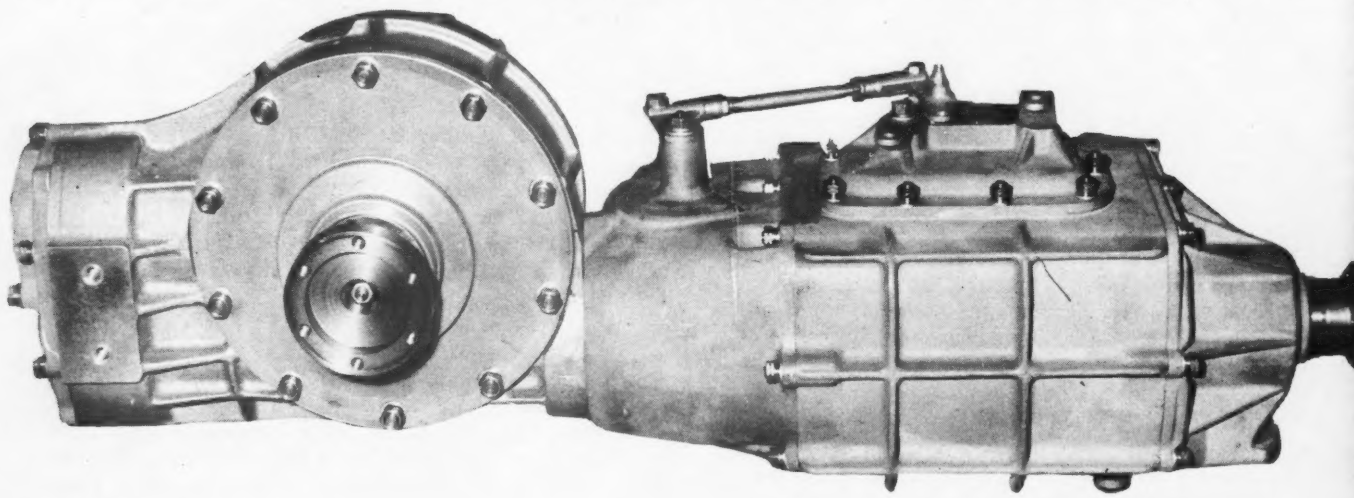
If the water-cooled brakes are disappointing there's an easy remedy: just buy Dunlop caliper-type disc brakes over the counter. But RAI is looking, of course, in all areas for solutions that are better than and not merely equal to what the competition already has. At any rate, given brakes that are at least equal to the available Dunlop discs, the monoposto's lap times will quicken.

Testing the F1 Scarab at Riverside has been a revealing and very educational experience. Daigh can take it around at 2:04 and literally motor around the corners, with attitude of car and wheels almost perfectly normal. But at 2:02 it's a different world and it's here that aspects of performance manifest themselves that are unknown to production car drivers and that few competition sports car drivers are aware of.

Consider the much written-about ideal of race-car handling: neutral steer, by virtue of which a car goes through a corner at a slip angle with all four wheels pointing in the same direction. In the light of the F1 tests, chassis engineer Marshall Whitfield has this to say:

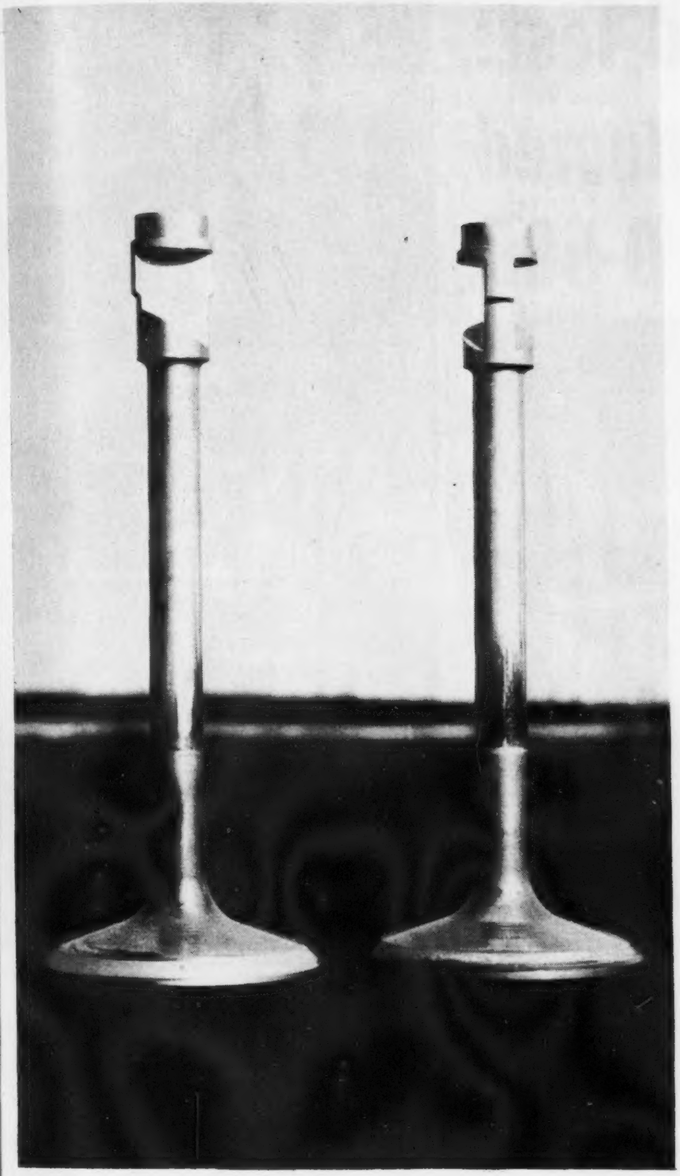


In best racing tradition is fully-machined, chrome-vanadium steel crankshaft of the Scarab. This crank is the more heavily counterbalanced of the two types that are being tested in the engine. Massive gear handles considerable load of drive train to cams, pumps, magnetos and injection.

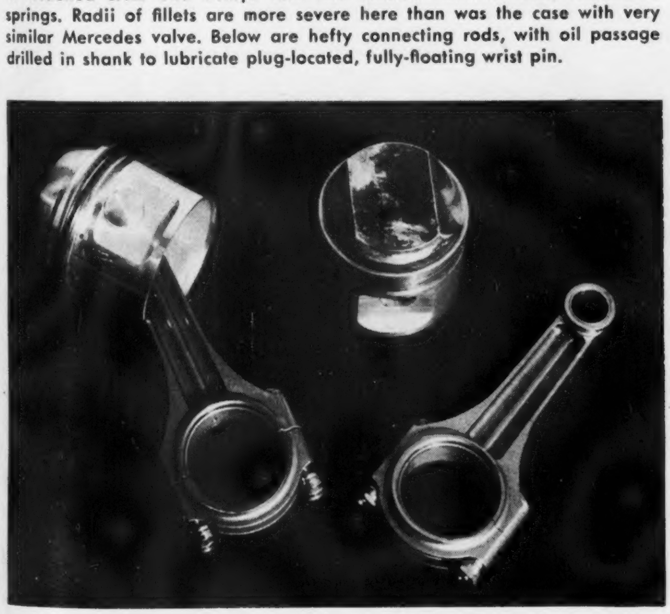


Halibrand rear end assembly and Corvette gearing assemble into a neat package for the F1 Scarab. Casing between them encloses auxiliary cogs for low starting first gear and for reverse. The entire assembly is offset to the driver's left, calling for very short left-hand wheel drive shaft.

Here's the Scarab's desmodromic valve gear in its latest form. It's interesting to note that the relatively crude form of clearance adjustment first proposed has been replaced by the Mercedes-type eccentric-sleeve system. Serrated locking collars for these sleeves can be seen adjacent to the cam in the foreground. Unlike Mercedes and OSCA, RAI found room for a cam support bearing between each valve. Compare with SCI, May 1957, page 26.



Whittled from stainless steel, Scarab's valves are heavy-stemmed. Slots in widened stem end accept fork that returns valve to seat, instead of springs. Radii of fillets are more severe here than was the case with very similar Mercedes valve. Below are hefty connecting rods, with oil passage drilled in shank to lubricate plug-located, fully-floating wrist pin.



"The neutral steer point in a real race car is meaningless. It's the *range* through which the car can operate that really counts. Granted, this mythical point happens to fall about midway in the expected behavior of the car, but it's probably the least important thing. To try to get a car to neutral-steer first and then to try to get it to do the things a car is supposed to do is probably the poorest way to shoot for expected car behavior. It has to be able to work in a corner. Right in the middle of a corner, if necessary, you have to be able to get on the brakes hard, get on the power hard, or steer it. You have to be able to do this to degrees that few sports car people are used to thinking of."

The RAI people have set almost unbelievable requirements for the F1 car's ability to brake while entering corners and to accelerate while emerging. In a fast turn such as turn six at Riverside they expect the driver to be able to use *full* throttle about half way through the bend which, for a hard-accelerating car, is asking a lot. A car that can work like this is going to be fast but it's not likely to neutral-steer.

How do you get a car to work well under these conditions? The problem involves many variables. Camber, keeping the wheels straight up and down, is crucial. Suspension geometry *not* related to camber, plus springs, shocks, tires and wheels are other critical factors. To Whitfield's chagrin as a professional engineer, the interactions of these factors do not lend themselves to mathematical manipulation. Instead of science, art seems to be called for here . . . a sort of subjective tuning in which the elusive human driver factor is all-important.

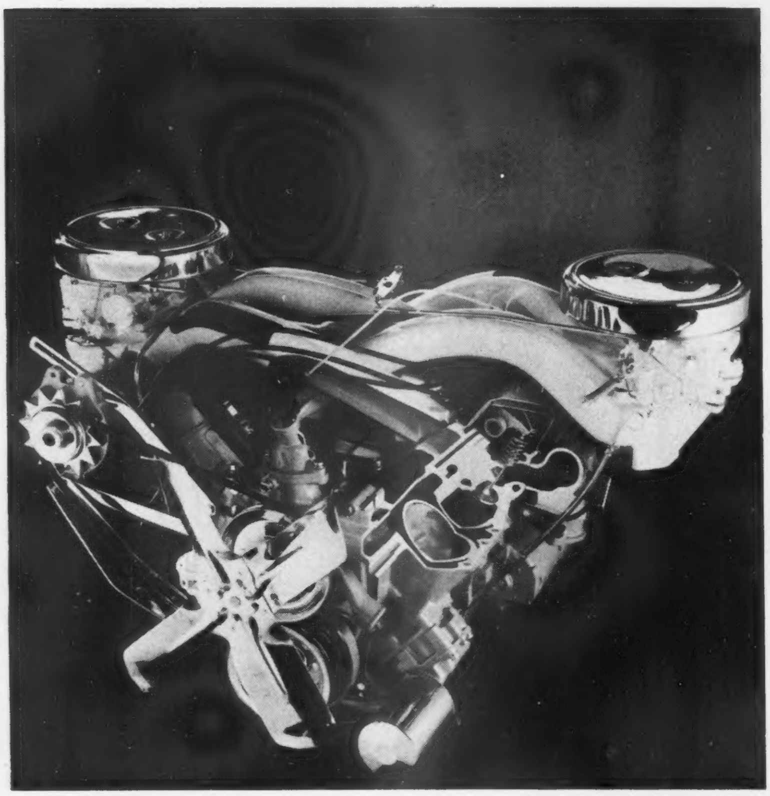
The practice of this chassis alchemy has been facilitated by the abundance of suspension-member adjustments described in these pages last May. For example, the coil springs with centrally-contained shocks are retained by a single nut on the bottom of the shock. Spring tension can be adjusted simply by spinning the nut up or down or another spring can be installed by removing the nut. Tests have been made with spring rates ranging from 25 to 300 pounds per inch!

Goodyear Tire & Rubber Co. has contracted to supply tires for the F1 Scarab and many types have been tested. Experience with these has confirmed Whitfield's long-held thesis that a car, a safe and controllable car, must not react more quickly that its driver's reaction time . . . such as the complex reaction time necessary to move a steering wheel or throttle. With one type of tire the car will be the world's most forgiving and with a set of another type, the least. A tire can develop great cornering force quickly . . . and then drop right off in bite. You can hang the rear end out so far and all is lovely; another inch and you're on ice. This happens with a too-stiff tire while a too-soft one sends you mushing through the turns badly out of shape. Tires that are ideal for the car-driver system still are being studied.

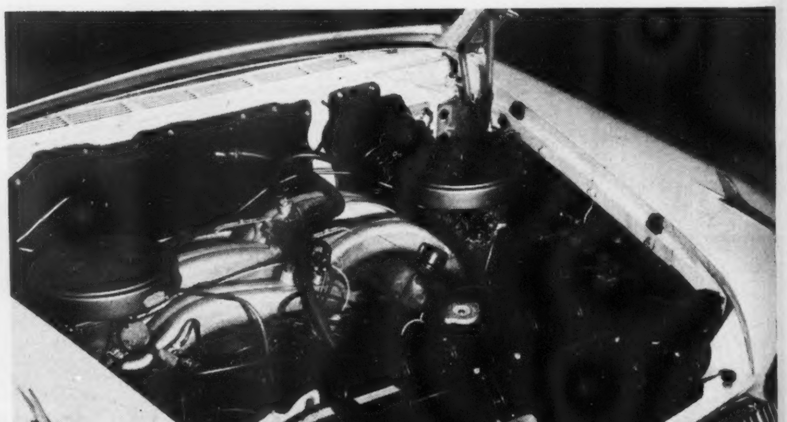
By the time these lines are in print the 2½-liter Scarab-engined Scarab should have left its larval stage and be ready to take its place among the starters in the *Grandes Epreuves.* Luck!

—gb

Road Test: Ram-Inducted Dodge Dart D-500



"What's all this I hear about Ram Induction?" Actually, Dart drivers can make other road users a trifle sheepish at stop light show downs.



Low placement of both carburetors is a secondary advantage of the Dart's ram-tuned induction manifold. Three suitcases and the spare hardly make a dent in the space available in the Dodge's luggage locker. Spring-loaded key-activated lid was a good fit, but needed slamming for positive locking.

▶ Though the 1960 spotlight's been on the all-new compact cars, there's been action on the home front, too. Chrysler Corporation has changed to unitized body-frame construction and, as an option for the large V8 power plants, they have presented ram induction. To sample these for our readers, we selected the D-500-engined Dodge Dart because it gives us a chance to comment on the creation of this new line as well.

There are three reasons for creating a new brand name:
–a completely new product
–a gain in prestige
–a merchandising gimmick to separate similar products which are retailed through independent channels.

With engine, transmission and wheelbase identical to the Plymouth's, it is hard to escape the decision that the Dodge Dart, touted as "all-new" and "the one fine car in the low-price field," is really a twin sister wearing a different dress. Model for model, there is a Plymouth for every Dart, and at $20 less.

In styling, they are as independent as any two cars using the same body shell, but other differences are hard to spot. Published dimensions, internal and external, vary so little that it's easy to surmise that most represent extremes of allowed tolerances rather than actual design differences.

Now there's nothing wrong with this; in fact, we're delighted to see added variety in the market place, even if it is only skin deep.

No more all-new than the Plymouth, the Dart offers very little extra prestige (but for $20, how much do you expect?), leading us to the conclusion that the brand name "Dart" has been created for merchandising reasons only.

Chrysler Corporation is well aware of the strange goings-on in the medium-priced field. The public is still buying a fair number of medium-priced cars, but mostly from low-price brand dealers. The answer, for Dodge dealers at least, is to make them low price dealers, too. The Dart is the device that does this. Till last year, he was one anyway, for he also sold Plymouths. Not that there was much difference between the two brands anyway, but this year Dodge dealers sell Dodges and nothing else. The Dart is the product that makes him a low-priced dealer. By calling it a Dodge instead of a Plymouth, it and the dealer tie in better with the factory's national advertising. This symbolizes a trend toward a brand name that designates a dealer network rather than an explicit automobile. Considering only body and trim options, for instance, there are 25 different Dodges to choose from. The Valiant is exactly the other way around, being sold through selected Plymouth, De Soto or Chrysler-Imperial dealers. It will be interesting to see which trend is dominant in the future. Will we have dealerships like independent supermarkets which sell many different brands, or will they be like those supermarkets which specialize in "house-brand" names? Or will there be both? Either way, the dealers (the factories' actual "customers") want to offer a wide variety to appeal to a wide market.

To maintain a strong image locally, he usually stays with one brand. To give him variety, the spread within a brand is greater than the difference between some brands. Of course, there is considerable product resemblance throughout a line, but the car tested, with its automatic transmission and big, hot V8, is more like any other contemporary V8 sedan with similar options than it is like the simply upholstered, six cylinder Dodge Dart Fleet model with stick shift.

Some critics claim that Detroit builds cars with "too much" horsepower, many others comment that there's certainly enough for everyday use, yet here comes the Chrysler Corporation with an expensive option to give even more. How come? No one forces you to take all these horses if you don't want them. You have your choice of 145, 230, 255, the 310 of the car tested and, on special order only, 330 bhp.

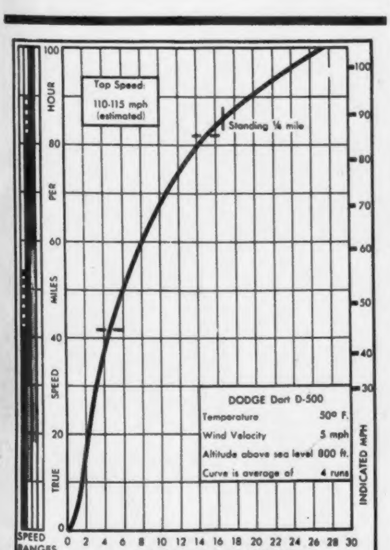
Just as the body style and degree of luxury in the trim

(Continued on page 93)

ROAD TEST

DODGE DART "Phoenix" D500

Price as tested:	$3746 ($2720 basic)
Manufacturer:	Dodge Division Chrysler Corporation Detroit, Michigan



ENGINE:

Displacement	361 cu in, 5920 cc
Dimensions	Eight cyl, 4.12 x 3.38 in
Compression Ratio	10.0 to one
Power (SAE)	310 bhp @ 4800 rpm
Torque	435 lbs-ft @ 2800 rpm
Usable rpm Range	750-4800 rpm
Piston Speed $\div \sqrt{s/b}$ @ rated power	2980 ft/min
Fuel Recommended	Super-premium
Mileage	10-14 mpg
Range	200-280 miles

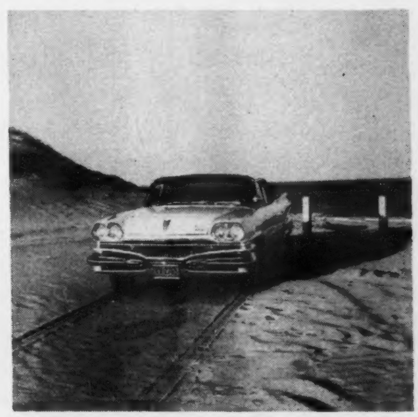
CHASSIS:

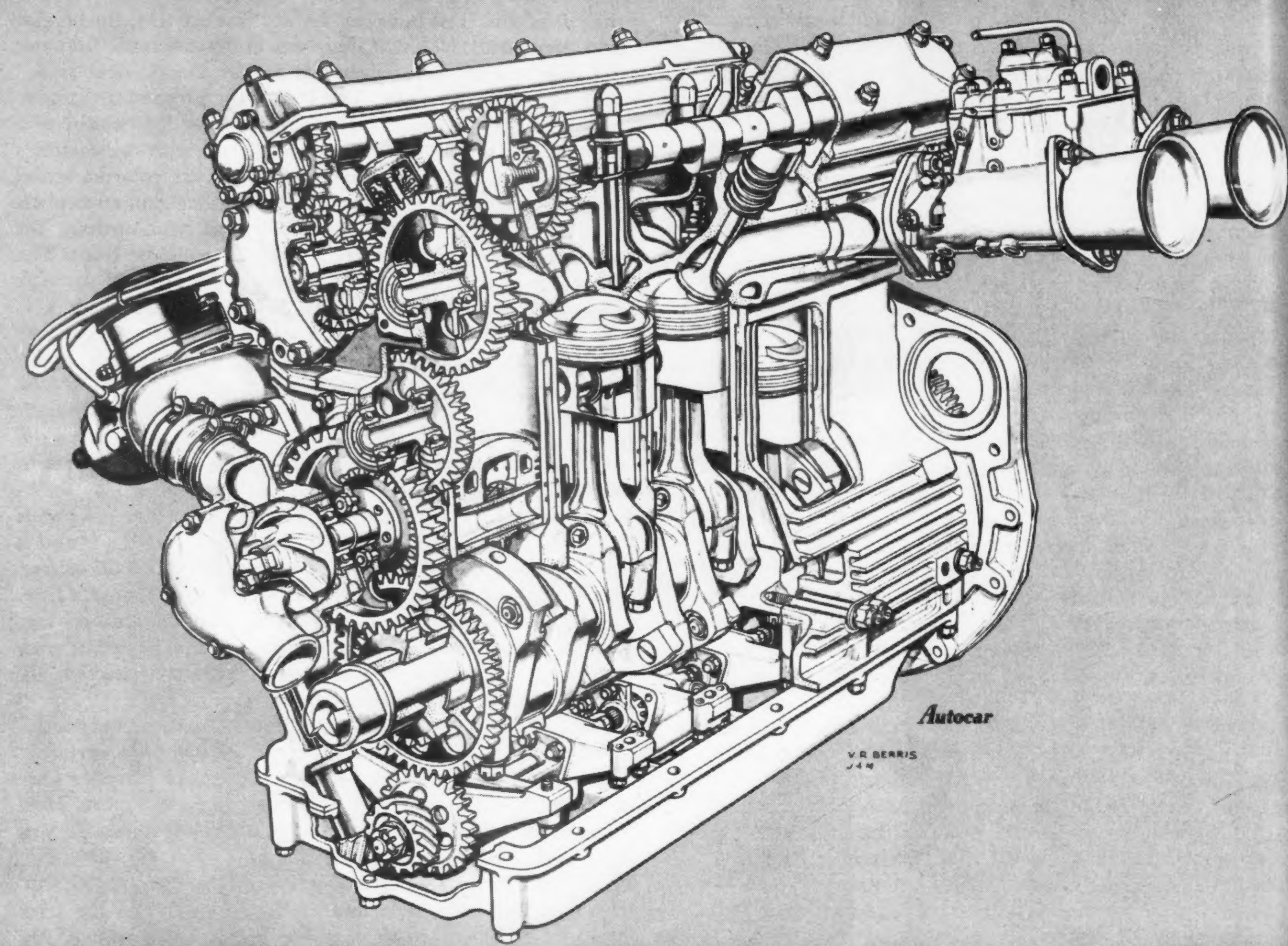
Wheelbase	118 in
Tread, F,R	61½, 60¼ in
Length	208½ in
Suspension:	F, ind, wishbones, torsion bars. R, rigid axle, asym. leaf springs.
Turns to Full Lock	1¾ (2¾ w/o power)
Tire Size	8.00 x 14 (7.50 x 14 std)
Swept Braking Area	184 sq in
Curb Weight (full tank)	4120 lbs
Percentage on Driving Wheels	46%
Test Weight	4350 lbs

DRIVE TRAIN:

Gear	Ratio	Step	Overall	Mph per 1000 rpm
Rev	2.00		6.62	11.7
		n/a		
1st	2.45		8.10	9.6
		69%		
2nd	1.45		4.80	16.2
		45%		
3rd	1.00		3.31	23.5

Torque converter ratio: 2.2 @ 1910 rpm
Final Drive Ratios: 3.31 to one standard, 2.93 optional





The cutaway reveals salient features of the latest 2495 cc version of the Coventry Climax four. Main changes for 1959 were moving the water pump from the cylinder head to the crankcase, the addition of extra balance weights for the crankshaft, and bracing studs for the steel main bearing caps. Three oil pumps are placed in tandem below the main caps. This engine is derived from one cylinder head of the Climax V8, also shown, which weighed 340 pounds and experimentally developed 260 bhp. It's likely that this engine will be resurrected and brought up to date with the aid of the lessons learned with the four-cylinder.

Leonard P. Lee (left), chairman and managing director of Coventry Climax, discusses a problem with his chief engineer, Walter Hassan, who is holding one of the latest $2\frac{1}{2}$ liter pistons.

No better-qualified man could possibly be found to write the story of the twin-cam Coventry Climax. From prewar design work at E.R.A. and a postwar stint as head of the drawing office that produced the V16 B.R.M., Harry Mundy progressed to the chief designer's post at this Coventry firm. He was personally responsible for the design of the single-cam four, of the $2\frac{1}{2}$-liter V8 and of the original twin-cam engine from which this unit grew. Harry's intimate knowledge of matters mechanical continues to stand him in good stead as Technical Editor of THE AUTOCAR.

▶ "I 'spect I growed. Don't think nobody never made me."

* * * * *

Topsy's immortal words couldn't be applied directly to the very successful Coventry Climax $2\frac{1}{2}$-liter Grand Prize engine, but they give a broad indication of its development history. The achievements of this old-established Coventry firm are all the more remarkable when it is realized that racing engines represent a very small portion of their effort and are, indeed, something of a sideline. Their main business is the design and manufacture of fork lift trucks, industrial diesel engines of many types, generating sets and fire pumps.

It's probably true to say that they have produced more racing engines than any other single company. Apart from large numbers of their single camshaft 1100 cc to 1500 cc range, the almost universal engine for sports car racing in Great Britain, in the past two years they have sold 156 of

TRIUMPHANT CLIMAX

Decended from a fire pump engine? Only in the sense that it extinguished the Grand Prize hopes of the rest of the racing world.

by Harry Mundy

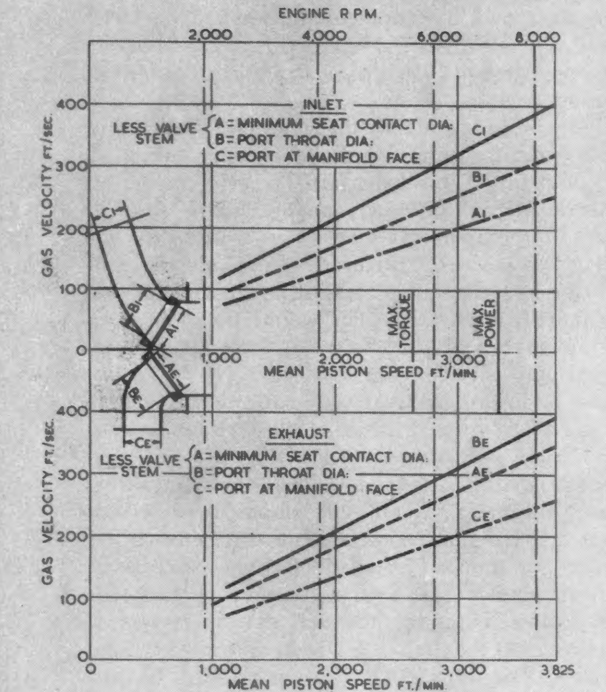
their twin-camshaft racing engines in addition to those produced for their own development purposes. They have powered the Coopers to win the world constructor's championship for Formula 2 in 1958 and 1959, and the Formula 1 championship in 1959.

It has been erroneously stated many times that the present Grand Prize $2\frac{1}{2}$-liter Coventry Climax engine was developed from a fire pump unit. This is perfectly true in respect of the single-overhead-camshaft sports-racing engine, but it doesn't apply to the twin camshaft unit, which was designed from its inception for racing. Considerable thought was given to ease of manufacture, and although some of the features are more complicated than would be used in a normal production engine, in general it is comparatively straightforward and simple. The present 2495 cc. four-cylinder engine has been directly developed from the 1475 cc unit first designed towards the end of 1954 and raced in 1957, but its lineage goes back further than this.

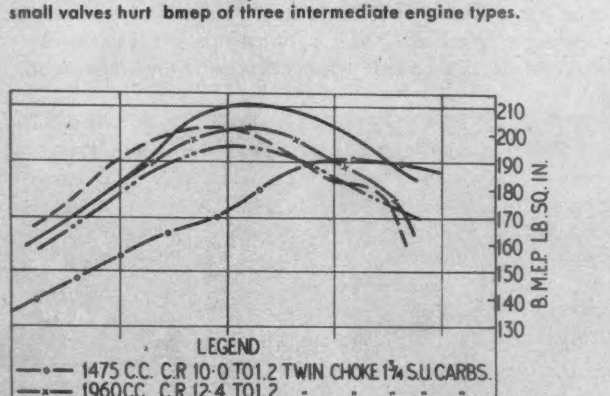
In 1953 Coventry Climax designed a V8 $2\frac{1}{2}$-liter and three prototypes were built. Considerable development work was done with an S.U. fuel injection system and carburetors and a maximum power of 264 bhp at 7900 rpm was achieved using 65 percent alcohol fuel with a compression ratio of 12.3 to 1. It became apparent, however, that there was a much bigger market in the then-new $1\frac{1}{2}$-liter Formula 2 class and firms such as Cooper and Lotus were pressing for an engine to meet their needs. They were not at that time interested in the V8, which had a bore of 3.00 inches and a stroke of 2.675 inches.

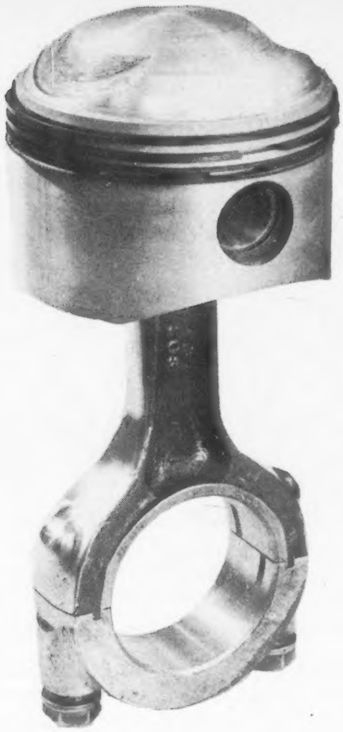
Investigations showed that with small alterations to water passages and ports the cylinder head assembly from the V8 could be utilized for the new four-cylinder $1\frac{1}{2}$-liter. With a V8 layout the cylinder spacing is wider than that required by an in-line engine of similar proportions because of the customary use of side-by-side connecting rods on a common crankpin.

In the V8 engine the spherical segment of the combustion chamber didn't extend to the joint face; there was an annular ring 3 inches in diameter approximately 0.125 inch deep before the shape blended into the hemispherical form. In other words, the cylinder bore was extended slightly within the combustion chamber. By retaining the same generation point for the spherical radius of the combustion chamber and extending it to the joint face a diameter of 3.2 inches resulted which seemed to fit in with the need to increase the capacity of four cylinders from 1.25 (half of the V8) to 1.50 liters. Many designers will try to build an aura 'round themselves to justify a particular choice of stroke to bore ratio, but it is not as scientific as some of them would have the layman believe. There are a number of factors involved. In the case of the Climax the decision was fairly mundane and meant cutting the suit according

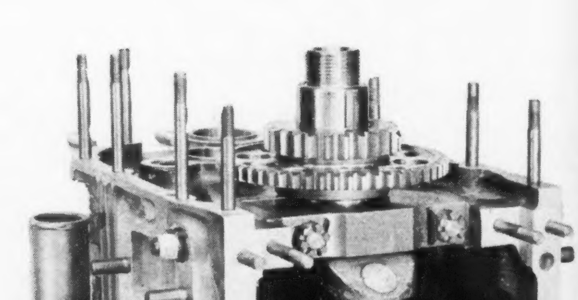


Above is a graphic presentation of gas velocities through ports and valves of the 1475 cc engine. Figures would be higher for 1960 and 2203 cc engines, about the same for latest 2495 cc unit. Family of curves below shows how small valves hurt bmep of three intermediate engine types.





Piston and connecting rod, above, make a short and sturdy unit. Interlocking of big-end cap joint for strength can be seen. Below, the bottom-end is seen with crank and main caps in place. Oil entry and exit fittings are on the crankcase side, which is ribbed for cooling and stiffness.



to the cloth, but the results speak for themselves. There was still sufficient space between the bores for a good fire joint and this land was reduced further as the capacity was increased up to its present limit of 2½ liters.

An increase in bore size alone did not give the maximum capacity for 1½ liters and the stroke of the V8 was increased by 0.125 inch to 2.80 inches. This in its turn was controlled by another consideration: To use the existing dies it was desirable to retain the connecting rods used on the V8 without reducing the ratio of rod center length to stroke by too great a margin. This latter point kept us from employing a longer stroke at that time.

As development proceeded it became evident that the original connecting rod design was unsatisfactory. In order to allow the rod to pass through the bore during routine maintenance the joint face between the rod and the cap was split at an angle of 45 degrees. This resulted in a long unsupported ear on one side of the rod, and despite the use of a cap with a web on each side to brace the stud bosses, flexing was taking place. This weakness became more apparent in the two-liter version and a normal design, using a horizontal split, was introduced and at the same time the bolt diameter was increased from ⅜ inch to 7⁄16 inch. Eventually in the 2½-liter version, using the same rod forging, the diameter was increased further to ½ inch.

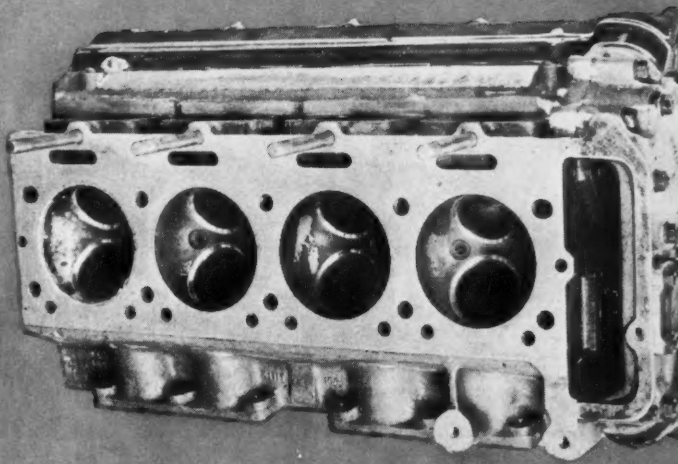
Basic features of the engine are a combined light alloy crankcase and cylinder block with removable wet liners, a train of spur gears to drive the camshafts and other auxiliaries, and an unusual arrangement for the oil pumps (one pressure and two scavenge) mounted below the main bearing caps.

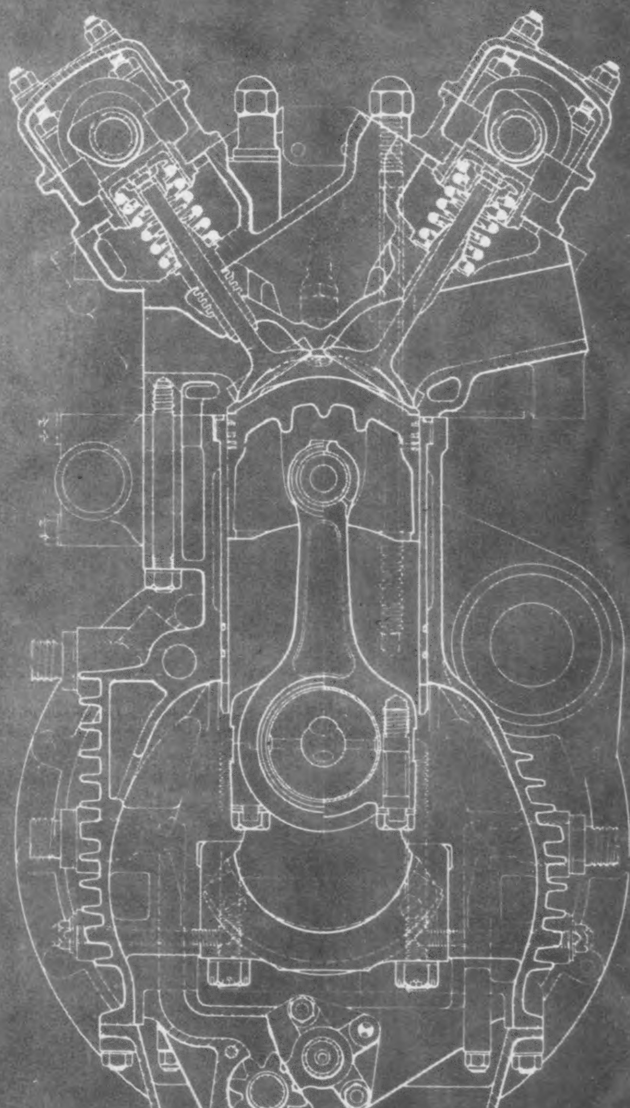
The cylinder head's combustion chamber form and valve angles have remained unchanged in the transition from the V8, through the 1½-liter to the 2½-liter version, although valve head and port diameters have been enlarged. The cylinder head is a heat-treated aluminum casting having the intake valves positioned at 32 degrees and the exhaust at 34 degrees from the vertical axis. Both are slightly offset from the geometric center of the hemisphere to achieve large valve area. In the original 1½-liter engine (which had the same size valves as the V8), the head diameter of the inlet valve is 1.75 inches and that of the exhaust 1.60 inches. These sizes were retained for the 1960 cc and the 2203 cc versions. For the Mark I 2495 cc unit they were enlarged to 1.93 inches and 1.687 inches respectively. In the Mark 2 version, which was first used by Jack Brabham in the British Grand Prix at Aintree in 1959, the inlet was increased still further to 2.062 inches diameter, retaining the same size of exhaust valve. A slight increase has also been made in the wrist pin size. A 15⁄16 inch diameter was used in all engines up to the 2.2-liter, but this was increased to one inch for the 2½-liter versions.

Throughout the range of engines the same cam form has been used. The lift is 0.410 inch (ignoring the small portion of the "quieting" ramps) and the total valve opening period for intake and exhaust is 290 degrees. Experimental cams have been produced to increase the dwell at full opening with modified timing, but they haven't been used in any races as they gave no advantage in power. In other words, the engine appears to be insensitive to changes in this department.

If there is an outstanding feature on this Climax engine it is in respect of the intake port sizes when compared with contemporary racing engines. A graph is reproduced to show the velocities in both the intake and exhaust ports and it will be seen that, particularly in regard to the intake, these are relatively high. The theory behind this is that power is obtained by keeping up the velocity of the incoming charge in a long port behind the inlet valve so that the mixture is piled up at the time of opening. In the V8 and 1½-liter the original diameter of the inlet port at the manifold joint face was 1.250 inches. This has been increased to 1.500

(Continued on page 78)





PHOTOGRAPHY: DOLIN

Nassau Was Nice

by Warren Weith

Bob Holbert, lost in town, looks vainly for the dock and the LST ferry to take his hot running RSK back to the mainland.

George Constantine passes a slow running Aston Martin coupe in Esso Bend during his winning drive in the Nassau Trophy race.

▶ One of the more difficult things that staff members of automobile magazines have to do is cover Nassau Speed Week. Being torn from a paper-strewn desk in New York, limousined to Idlewild Airport and being taken thence to a semi-tropical island via a BOAC turbo-prop Britannia can be a trying experience. One bit of technical information garnered on the flight down—we are always on the *qui vive* for inside technical information when out of the office—pistonless engines are so smooth that a brimming champagne glass will remain unspilled on one's lap tray for long periods of time. On reflection this point seems to have little to do with motor racing, but at the time there seemed to be some connection. This attitude was heightened when, upon arrival, we received our press credentials and a book of ten tickets for that number of cocktail parties arranged by the Nassau Development Board.

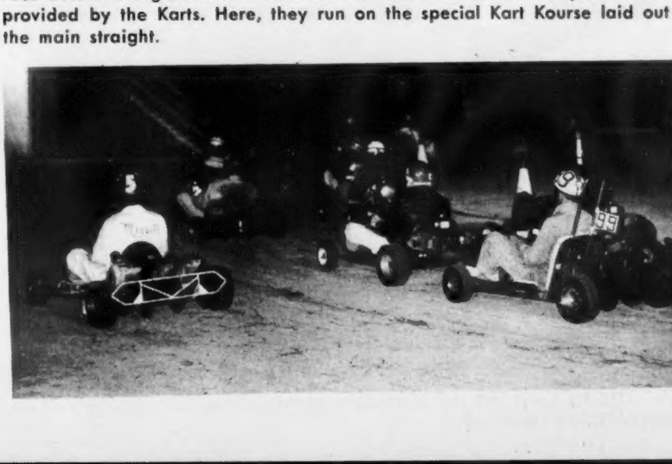
The trip into town from the airport—remembering to keep the rented VW on the left side of the road to comply with English traffic regulations—made it clear that there were a great number of people on the island intent on some competitive motoring. Sighted, but briefly, on this twenty-minute ride were two RSK Porsches, one Ferrari California, a Lotus, a gaggle of Abarth Fiats and too many roll-bar equipped Healeys to count. Aside from the lovely sights and sounds of race-type cars running on the open road, it was fun to watch the local population trying to ignore—with true British reserve—a well blipped throttle that was almost directly connected to four straight exhaust pipes.

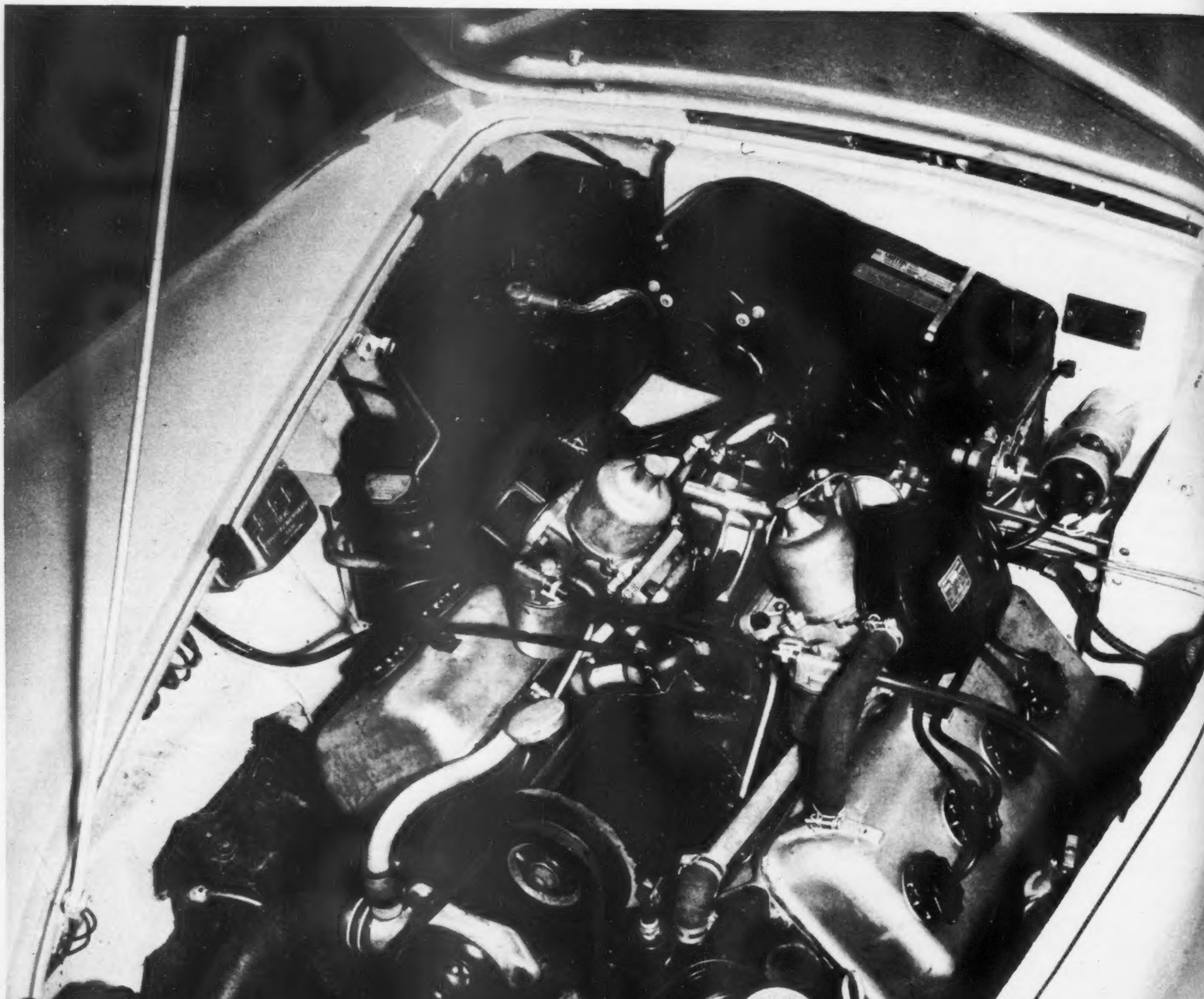
The running of the Nassau Tourist Trophy race on Sunday was the opener of the racing portion of the Sixth Annual International Bahamas Speed Week. The rest of the racing week looked like this, according to the little green booklet containing race meeting instructions, compiled by the Bahamas Automobile Club: Wednesday, scrutineering and practice; Thursday, mandatory practice; Friday, Governor's Trophy Race; Saturday, Bahamas Cup Awards; and Sunday, International Nassau Trophy Race. The social side of the week got the green flag on Saturday night at Blackbeard's Tavern. Contemplation of the rest of the tilted-glass agenda at breakfast on Sunday revealed the following: that night, Dirty Dick's; Monday, Junkanoo Club; Tuesday; Pilot House Club; Wednesday, Nassau Beach Lodge; Thursday, Coral Harbor Club; Friday, Fort Montagu Beach Hotel and Cabana Club; Saturday, Emerald Beach Hotel; and Monday, International Motor Ball. It was a challenge that required sober planning and husbanding of one's strength.

Sunday's racing might have been called another chapter in the story of the Moss jinx. Driving a brand new pea-green Aston Martin DB 4 GT coupe owned by Frank de Arellano of San Juan, Puerto Rico, Moss took an early and commanding lead in the first four laps. On the fifth lap a nut holding together sections of the carburetor cold-air box jiggled loose and worked its way into the intake manifold port. Result: one badly mangled valve. With Moss out, Johnny Cuevas had no trouble in placing his Team Camoradi Carrera in front and keeping it there for the remaining 20 laps. His winning average of 78.010 mph neatly shaved the race record of 76.74 mph set by Jim Jeffords in a Corvette last year. Other interesting notes on this race might include Roy Salvadori's trip into the jungle with the Sebring Austin-Healey, an excursion that also took place on the fateful fifth lap. Roy's long trip on the unpaved portion of the circuit put "paid" to his chances in the race. Any student of U.S.-style road racing would have been amazed at the ferocity with which European professionals can and do drive. Cars are driven right to the limit and perhaps a bit beyond. A handful of sand or a patch of oil on the track—or for that matter an unexpected puff of wind—can destroy the delicate balance of a car being driven full bore. All of this might serve to explain how and why Salvadori managed to get his car so well and truly up in the woods.

(Continued on page 91)

Shelby concentrates in the bird cage Maserati. This car led for most of the race before being sidelined when the de Dion tube broke. Noisy, fast fun was provided by the Karts. Here, they run on the special Kart Kourse laid out on the main straight.





Road Research Report: DAIMLER SP250

► The Daimler SP250 is a light, powerful, fiberglass-bodied two-seater sports car. Its newly-designed 2½ liter V8 engine, conservatively rated by its British builders at 140 bhp, has only 2280 pounds to contend with. The low weight is achieved through simplicity; a box-section frame mounts conventional coil spring and wishbone suspension at the front and a rigid axle located by semi-elliptic springs at the rear. The result: acceleration. Zero to 60 takes less than 10 seconds.

Daimler is one of the oldest names in motoring but it may surprise some readers that this car is built in England, not Germany. Gottlieb Daimler started companies bearing his name in both countries. Now a division of the Birmingham Small Arms group, the Daimler Car Company, Ltd. of Coventry was founded in 1896. In 1901 they distinguished themselves by selling King Edward VII his first motor carriage. They have been building quiet, comfortable cars for royalty and others of great wealth ever since. In 1930 they introduced the Fluid Flywheel, the first successful automatic transmission and one that is still in production.

To those familiar with this background, it's equally surprising that Daimler should now turn to sports cars. Doubly so, for the SP250 earns the title "sports car" through performance, not romance. A look at a few of the BSA group's other products suggests that a performance sports car is not out of keeping: rifles, machine tools, motorcycles (Ariel, BSA and Triumph), and from Daimler itself, armored scout cars and buses as well as the more sedate vehicles. (25% of England's omnibuses are Daimlers.) The motorcycles have sold well in America. As most of the first year's production of the SP250 will be exported to this continent, it is hoped that the two-wheel supply and servicing experience will serve the Daimler Division well.

The SP250 is an extraordinary mixture of the new and the conventional. Its compact engine (24-inches wide) combines smoothness and power to such a degree that it seems safe to predict both future power increases and, if the price is right, a good deal of engine-swapping.

Though the car is fitted with disc brakes all around, has a four-speed transmission, a fiberglass body, an option of wire wheels and other sports car flourishes, the engine is the hub of its technical merit. A full description of it will be found at the end of this report.

The design goal for the SP250 evidently was to ensure commercial success by combining its brilliant acceleration with touring utility and, for economy, sim-

plicity of construction and maintenance. The body design has several features which are often demanded but seldom found on high-performance sports cars. The doors are large and they open wide, there are roll-up windows and a glove compartment, the trunk is unbelievably large, and everything can be locked.

The Daimler's very simplicity is at once its greatest asset and its biggest liability. For instance, sports cars are supposed to be sleek and ground-hugging, preferably lower than contemporary sedans. Yet the requirement for a simple layout dictated an X-braced, box-section frame on top of which the cockpit is built. To get the driver low, the seats are close to the floor and, even so, are not tilted back for thigh support. The steering wheel is quite large, 16¾-inches in diameter, with a ⅞-inch thick rim to spread steering effort over a wide area. To keep it out of the driver's line of view, it must be close to his legs. The clearance between the rim and the seat cushion varies, depending on whether the telescopic steering column is pushed forward (5½-inches) or pulled all the way back (7). Perhaps if the steering box weren't so far forward, the steering wheel could be tilted toward the horizontal. This would give more clearance and give the driver better purchase for holding the SP250 into a tight turn.

The leather-covered seats are themselves very comfortable. Their foam-rubber cushions are quite soft, while the deeply curved backrests are firm to give good side support. There is an ample 7½ inches of adjustment, although when all the way back the leg room for that optional third passenger disappears as the front and rear seats meet.

The telescopic steering column, an all-too-rare extra, has a three-inch travel. We found close to the chest convenient for city driving, while pressing it away would let us assume a straight-arm technique for swooping through fast bends. The locking device was singularly difficult to reach, being at or beyond the dashboard most of the time, so we never had it fully tightened up.

The steering wheel is covered entirely in leather except at the hub. Somewhere a parking lot attendant stained it with grease, so we think this camouflage job on the standard British black steering wheel isn't going to be well received in the long run.

Instrumentation earns praise, being clear and straightforward. Directly in front of the driver are a large tachometer and matching speedometer. The latter is marked off in two mph increments with numbers every 20 mph. The tach reads to 7000 rpm but there is a large red warning line at 6000, which is the limit we observed throughout our test. The other gauges are grouped in a central panel which undoubtedly eases production of both left and right-hand models.

A glove compartment, about 13 by 6 by 4 inches, is directly in front of the passenger seat. Its door locks with the trunk key, making it safe for valuables. It is supplemented by pockets, about 12 by 4 inches, in each door.

The dashboard, like the wheel, is all leather-covered. There seems to be a resilient layer underneath and there's a protective roll across its top, but neither are thick enough to contribute significantly to safety. The windshield frame has a blade-like edge and the three latches for the folding top are rather bulky. The reflection of the cowl in the windshield doesn't matter because the windshield is so upright. However, if you're tall enough to see all the hood and fender profile over the wheel, you'll find that the top of the windshield is disturbingly low. This low height restricts the size of the wiper blades, so that the driver's corner goes unswept. Windshield washers are welcome as part of the "standard package of options," i.e., you can't get the Daimler without them. (Another standard option is the cigarette lighter.)

The windows crank down stiffly through 3¼ turns. An outside mirror would be worthwhile because, despite the large windows all around, there is still a blind spot over the driver's shoulder. The interior rear view mirror is a good compromise. It has a flat surface for good vision but is a little too small to see the entire view through the large back window, yet rather large for seeing all the right front fender.

The very simple top is typically British; it's not easy to put up or down. Perhaps the distinction between roadsters and convertibles should be based on this rather than on whether or not there are roll-up windows. There are 21 snaps in back and three latches along the windshield frame to undo. Nineteen of the 21 plus six others are used to attach the tonneau cover. The latches, incidentally, are spring-loaded, which makes fastening the top practically a two-man job. When the top is folded, they rub against the back window panel. Perhaps there is a better way to fold the top, but the directions aren't very explicit and it was too cold during our test to keep it down after the pictures were taken.

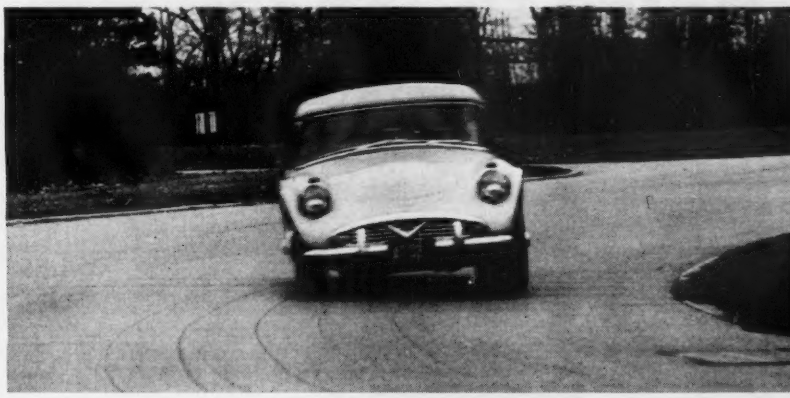
Although the side windows are very large, the short windshield causes the car to seem very "enclosed" when the top is up. The most forward snap fails to hold the top taut along the rear edge of the door windows, though the resulting drafts were not serious. We were assured that this is to be corrected on subsequent production.

We experienced quite a downpour while in the car and were very impressed by the complete absence of leaks. The heater pumped out lots of hot air and pulling out a knob marked "A" directed the entire blast onto the windshield. Temperature was controlled by sliding the lever back to the left. Pulling out on the end of it turns on the blower fan, though at highway speed it's not necessary. Perhaps fast driving in heavy rain isn't to be recommended, but if it's necessary, it would be safer if the wipers could be speeded up.

Though the trunk is protected by a groove in the bodywork, the rainwater on the lid itself ran forward

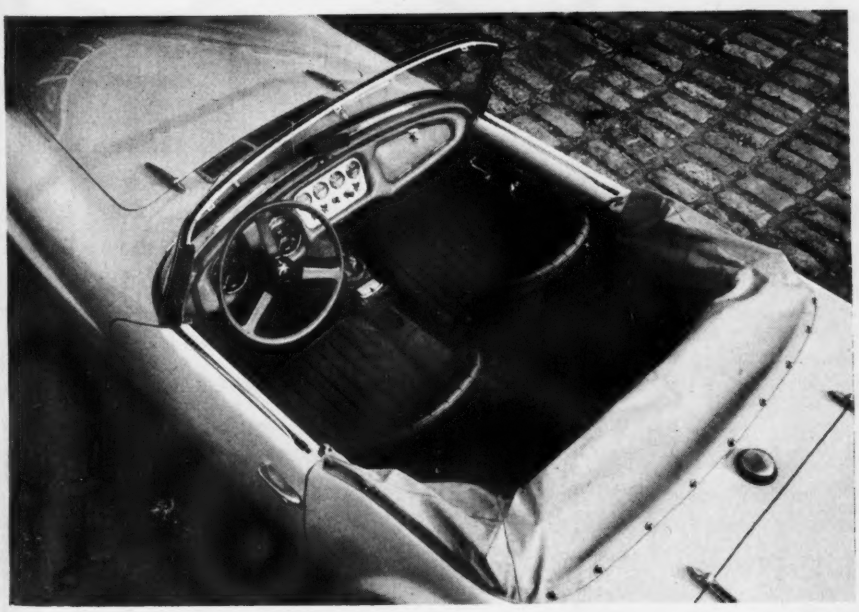
(Continued on page 70)

Left, protected by a low bumper, the long snout's grille bears a V for the superb engine and a fluted border to remind of the Daimler firm's traditions. Below, the SP250 corners like it's built; flat and firm. Tall top emphasizes low windshield.

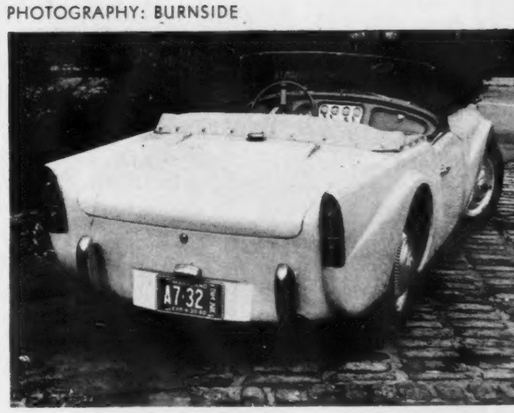


At a true 45 mph with the photographer on board, the swinging keychain tells more about speed than the horizon. Above, Hooper-built, close-coupled, razor-edged "saloon" was displayed at last Earls Court on Daimler's short SP250 chassis.

PHOTOGRAPHY: BURNSIDE



Fresh air intake, windows that roll down flush with top of doors, a jump seat for two children or one adult and lots of legroom in the front at least are outstanding features of the SP250.



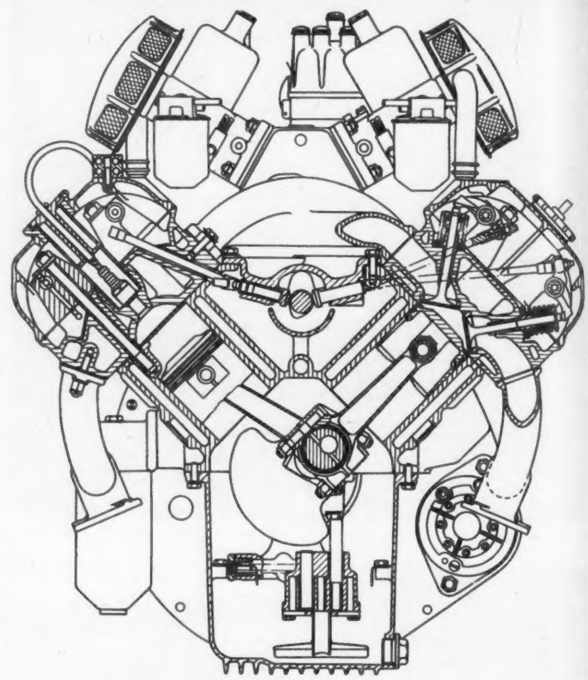
Sculptured sides make light fiberglass body rigid. Tailfins and tank-over-axle permit cavernous trunk.

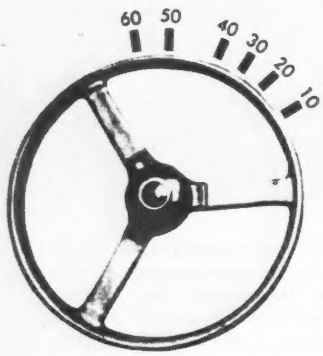
Road Research Report:

DAIMLER SP250

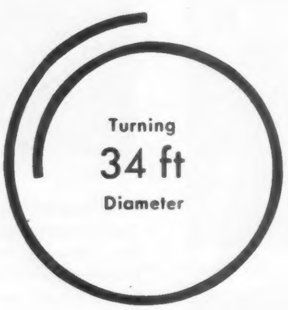
Importer: The Daimler Division Box 6790 Baltimore 4, Maryland

Price as tested	1000	$3923	7000
Displacement	20	155 cu in	300
Power (SAE—est.)	20	155 bhp	300
Curb Weight	1000	2280 lbs	4000
Swept Braking Area	100	438 sq in	
Weight on Driving Wheels	35	49%	65
Wheelbase	70	92 in	130
Piston Speed, "corrected"	1000	3030 fpm	4000
Speed @ 1000 rpm in Top Gear	10	21.0 mph	25
Mileage	10	23 mpg	40

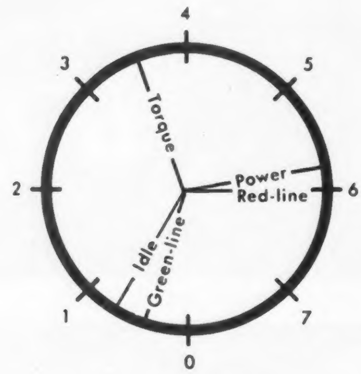




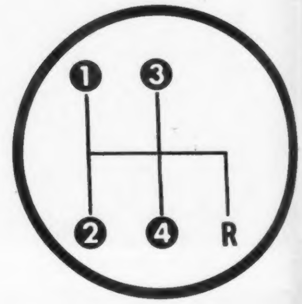
Steering Behavior



Turns to Full Lock



Engine Flexibility



Shift Pattern

ENGINE:

Displacement ....155 cu in, 2548 cc
Dimensions ....Eight cyl, 3.00 x 2.75 in
Compression Ratio ....8.2 to one
Power (SAE—est.)..........155 bhp @ 5800 rpm
Torque.........................155 lbs-ft @ 3600 rpm
Usable rpm Range....................400-6000 rpm
Piston Speed $\div \sqrt{s/b}$
@ rated power ....3030 ft/min
Fuel Recommended ....Premium
Mileage ....20-26 mpg
Range ....280-365 miles

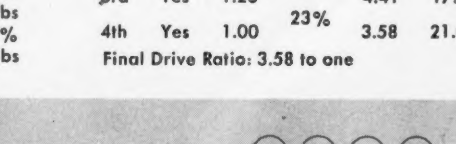
CHASSIS:

Wheelbase ....92 in
Tread, F,R ....50, 48 in
Length ....165 in
Suspension: F, ind., wishbones, coil springs. R, rigid axle, leaf springs.
Turn to Full Lock 1¼
Tire Size ....5.90 x 15
Swept Braking Area ....438 sq in
Curb Weight (full tank) ....2280 lbs
Percentage on Driving Wheels 49%
Test Weight ....2610 lbs

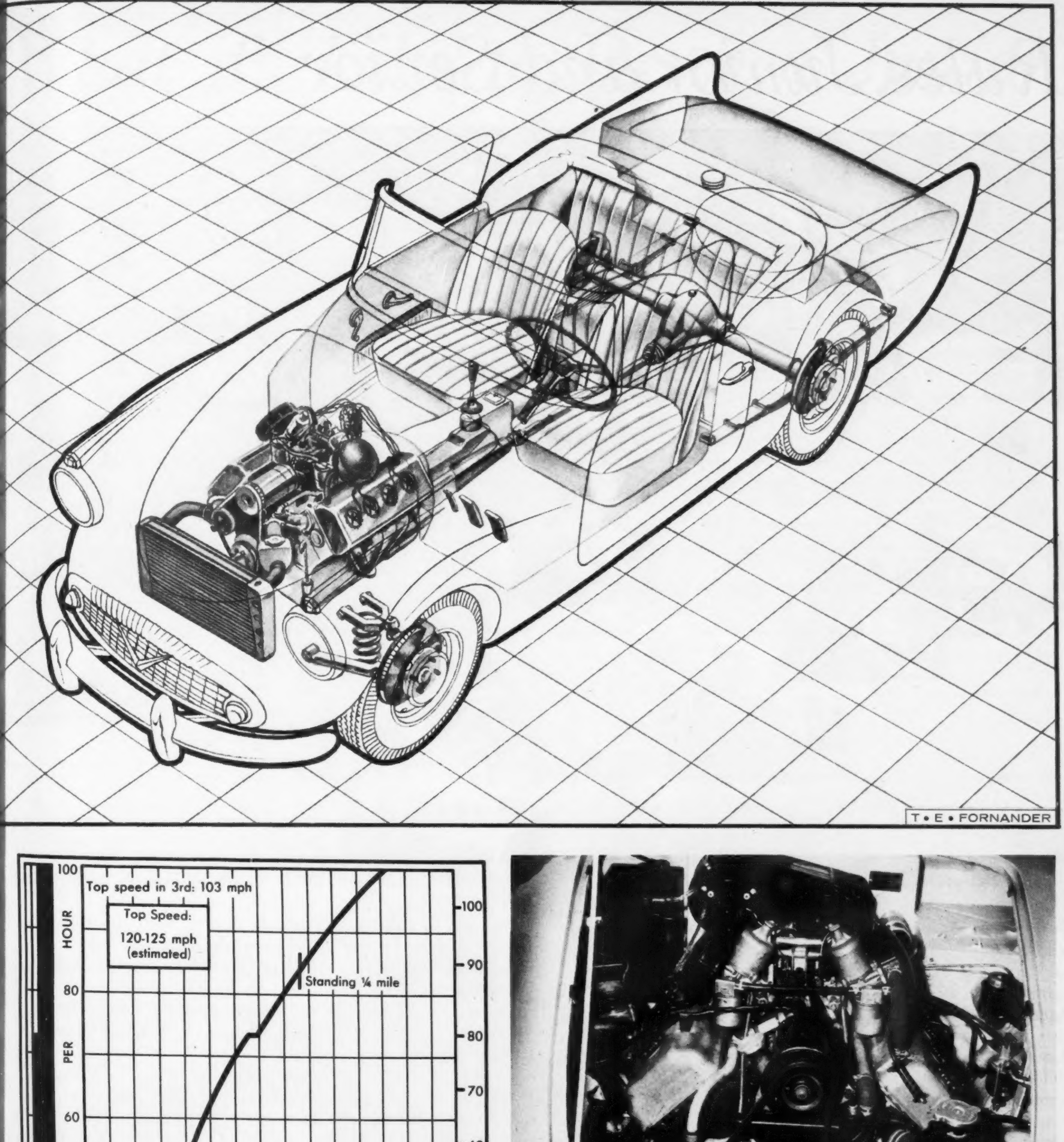
DRIVE TRAIN:

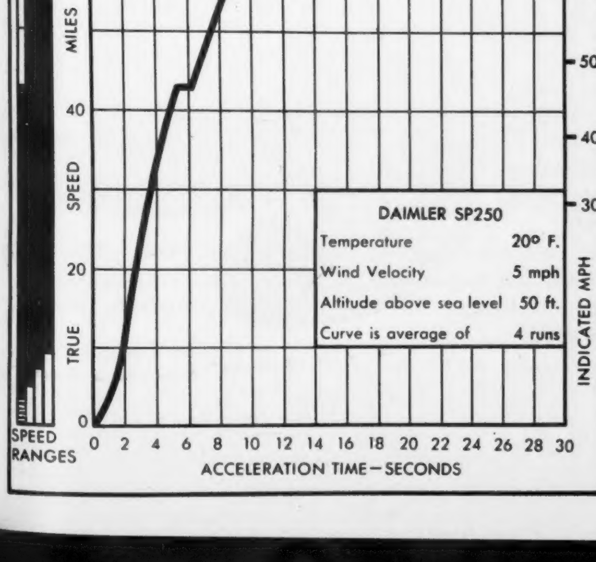
Gear	Synchro	Ratio	Step	Overall	Mph per 1000 rpm
Rev	No	3.77		13.50	5.6
			n/a		
1st	No	2.94		10.50	7.2
			69%		
2nd	Yes	1.74		6.24	12.1
			42%		
3rd	Yes	1.23		4.41	17.1
			23%		
4th	Yes	1.00		3.58	21.0

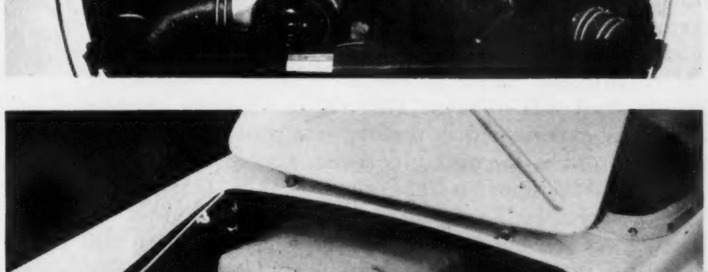
Final Drive Ratio: 3.58 to one



1 Tachometer
2 Speedometer
3 Fuel
4 Water Temperature
5 Oil Pressure
6 Ammeter
7 Head Lights
8 Panel Lights
9 Ignition
10 Choke
11 Windshield Wipers
12 Turn Signal
13 Windshield Washer
14 Heater
15 Defroster
16 Lighter


T • E • FORNANDER


Top speed in 3rd: 103 mph
Top Speed:
120-125 mph
(estimated)
Standing ¼ mile
DAIMLER SP250
Temperature 20° F.
Wind Velocity 5 mph
Altitude above sea level 50 ft.
Curve is average of 4 runs
TRUE SPEED MILES PER HOUR
INDICATED MPH
SPEED RANGES
ACCELERATION TIME—SECONDS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
0 20 40 60 80 100
30 40 50 60 70 80 90 100



Rules, Junior and Senior

► SCI gave Formula Junior its first big push in America with a six-page story in its May, 1959 issue. At that time we surveyed this lusty racing class as it existed in Italy and printed the full regulations that had just been made international by the F.I.A. Apart from a recommendation that thought be given to an "economy formula" based on American conditions, SCI took no special stand at that time. As the Juniors started to boom in this country we scrutinized the rules more closely and concluded tentatively that our international interests would be served best by sticking to the F.I.A. rules without deviation. This clashed with the stand of the 500 cc Club of America, and we've received some pointed remarks on the subject from people closely connected with that group.

Mark Brunner, Editor of the 500 cc Club's informative Bulletin, had this to say: "The 500 cc Club of America is uniquely experienced in pushing one class of racing car. We've been at it for over nine years, during which we've tried many variations on the Formula 3 rules. Our supplementary Formula 3 regulations, which are known as Formula A, are nationally observed and have been approved for the national point standings of the SCCA. We felt that Formula A was necessary for several reasons, the most prominent being economy and encouragement of home builders. We think it's been successful. It supplements the international Formula 3 rules with the following: Also allowed are 750 cc engines with side valves or with overhead valves in line with four water-cooled cylinders.

"From our experience with Formula A we were able to arrive at a starting point for Formula B—the supplement to Formula Junior."

Though the accompanying text is lengthy, the changes involved are actually modest ones. The Formula B amendments follow:

ARTICLE 2—Dimensions

c) Until the end of 1960, any car of open-wheel construction, built by an individual, rather than a factory shall be acceptable. i.e. Existing specials.

Capacity and Weight

c) Maximum capacity: 750 cc; Minimum weight 600 lbs.
d) Maximum capacity: 750 cc; Minimum weight 700 lbs. (Crosley engines)
e) Maximum capacity: 1300 cc; Minimum weight 1040 lbs.

Other categories may be established for other displacements if suitable engines are placed on the market or as F.I.A. classification changes. The basic rule of .80 pounds per cc will be followed.

(Continued on page 95)

What it's Like to Drive a Junior

▶ Is it dangerous? Not by any normal standards. Does it feel "different"? Not from any good racing sports car. Is it difficult to drive? Quite the contrary. Is it fun? Formula Junior is a four-alarm ball – at least from the driver's seat of a Taraschi.

These finely crafted Junior formula cars are made in Teramo, Italy by Mr. Taraschi, who has in the past been involved with the construction of Formula 3, 750 cc and 1100 cc Giaur racing cars. He built his first F.Jr. cars in 1958, and was able to score several successes in Italy against the swarms of Stanguellinis that already threaten to dominate Junior racing. Thus we were pleased to see that these Taraschis will be produced in some numbers and will be marketed in the U.S. by Biener Pontiac and Imported cars, of 250 and 275 Northern Boulevard, Great Neck, New York. Biener's imported car division, headed by Martin B. Biener, already handles Fiat, Lancia and Alfa Romeo cars, and should be well equipped to sell and service the Taraschi. List price, ready to race, has been set at $4800.

Looking at a glance like the Stanguellini, this sleek machine is radically different beneath the skin. Main points of similarity are the use of Fiat 1100 front suspension—liberally drilled for lightness—and of a straightforward ladder-type tubular frame. Instead of having the engine and drive line angled across the car, however, Taraschi offsets the whole affair to the right, counterbalancing the driver's strong leftward bias. Further this allows the engine to be placed more rearward, improving weight distribution, without encroaching on the driver's leg room.

The very good Fiat 1200 gearbox is used, fitted in unit with the engine with its remote control protruding conveniently from the broad shaft tunnel. Arrangements at the back are less normal, and account in large measure for the price difference between the Taraschi and Stanguellini. From its inception the Taraschi has had a de Dion rear suspension, and it remains the only Junior car you can buy with this type of rear end. To get a chassis-mounted differential complete with bearing journals and universal joints, Mr. Taraschi used a Fiat 600 gearbox/final drive casing with all its internals removed and replaced by a two-foot shaft. This expedient adds some weight which is bearable in view of the minimum weight limits imposed. Trailing radius rods and coil springs locate and suspend the de Dion axle. The mechanics of changing gear ratios aren't

(Continued on page 95)

by Karl Ludvigsen

PELATOWSKI

Available Junior Roundup

► Listed and illustrated here are ten Formula Junior cars which are, according to their makers and representatives, to be offered for sale in this country in 1960. Prices may vary a great deal, of course, depending on the equipment supplied and state of engine tune ordered. Most firms, especially the American ones, will gladly supply frames, suspension components and similar aids to the special builder. In addition we list here the addresses of other firms constructing Junior machines. Full details of these are not given either because the cars are not in final form or because U. S. distribution is not yet settled.

Automobiles D.B.
132, Avenue du General de Gaulle
Champigny-sur-Marne, France

Alfred Hartmann
Nonntal 10
Berchtesgaden, Germany

North-East Engineering Co. (Intermeccanica)
P.O. Box 153
Turin, Italy

Lotus Cars Ltd.
Delamare Road
Cheshunt, Hertfordshire
England

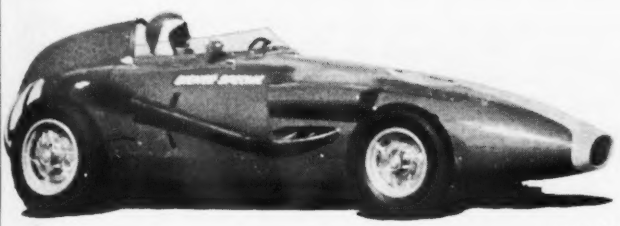
Autohaus Mitter
Leonberg (Stuttgart)
Germany

Fabbrica Automobili Moretti S.p.A.
Via Monginevro 280
Turin, Italy

Automobili OSCA
Fratelli Maserati
S. Lazzaro di Savena
Bologna, Italy

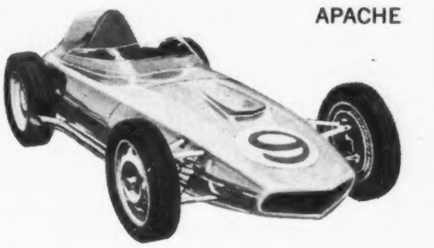
Giampolo Volpini
Via Corridoni 47
Milan, Italy

MAKE	SOURCE	PRICE	WHEELBASE	TREADS, F	& R	ENGINE	TUNED	GEARBOX
APACHE	Apache Racing Cars 1414 N. Main Street Walnut Creek, Calif.	$1985 (U.S.A.)	83"	46"	46"	none	n/a	none
COOPER	Joe Lubin 2268 Firestone Blvd. Los Angeles 2, Calif.	$3700 (England)	86"	46½"	45½"	Austin A35	highly	Austin A35
DANE	Dane Racing Cars 12969½ W. Washington Blvd. Los Angeles 66, Calif.	$2885 (U.S.A.)	92"	47.4"	50"	MG	yes	MG
ELVA	Columbia Triumph Dist., Inc. 10582 Metropolitan Avenue Kensington, Maryland	$3850 (U.S.A.)	89"	48"	48"	Austin A35	moderately	Austin A35
GEMINI	Automotive Research 5201 W. County Line Road Milwaukee, Wisconsin	$3895 (U.S.A.)	82"	46"	48"	Austin A35	moderately	Austin A35
RAM	Rodney Carveth, Inc. 3570 Tripp Road Woodside, Calif.	$4150 (U.S.A.)	—	—	—	Fiat 1100	highly	Fiat 1100
SADLER	Sadler Car Company St. Catherines, Ontario Canada	$2995 (Canada)	80"	47"	47"	Sprite	no	Sprite
STANGUELLINI	The Momo Corporation 55-02 Broadway Woodside, L. I., N. Y.	$4550 (U.S.A.)	79"	44.6"	44.1"	Fiat 1100	highly	Fiat 1100
TARASCHI	Biener Imported Cars 275 Northern Blvd. Great Neck, N. Y.	$4800 (U.S.A.)	79½"	46½"	45½"	Fiat 1100	highly	Fiat 1100
YIMKIN	Pit Stop Enterprises 1722 13th Street, N.W. Washington 9, D. C.	$2995 (U.S.A.)	86½"	47"	47"	Austin A35	moderately	Austin A35

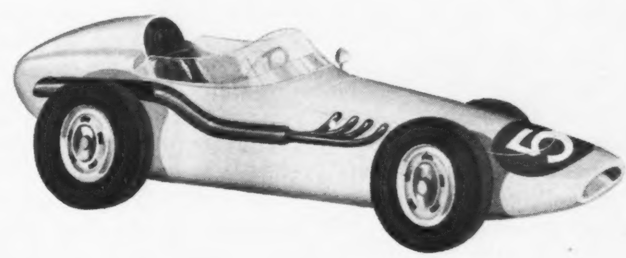


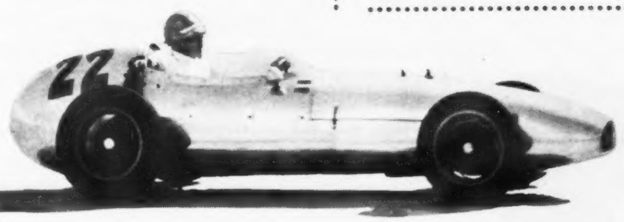
TARASCHI

APACHE



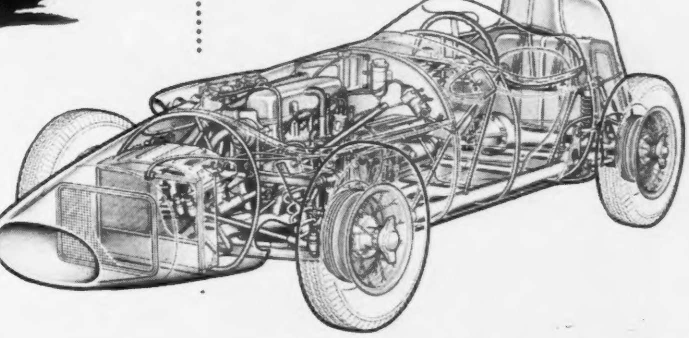
RAM



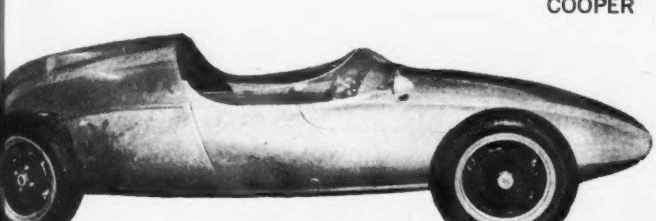


GEMINI

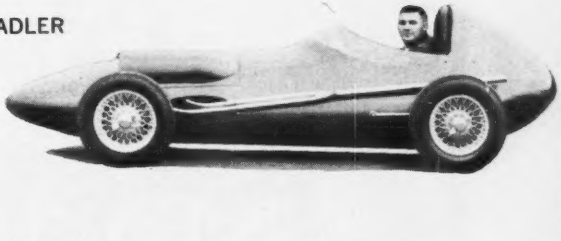
STANGUELLINI

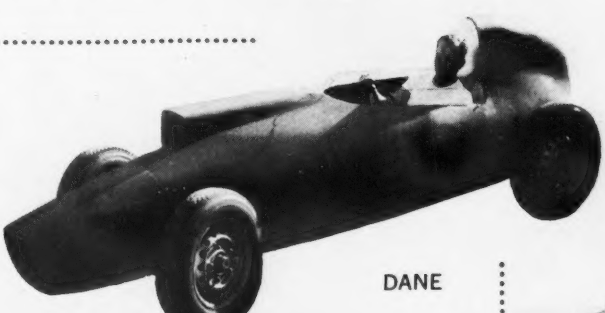


COOPER



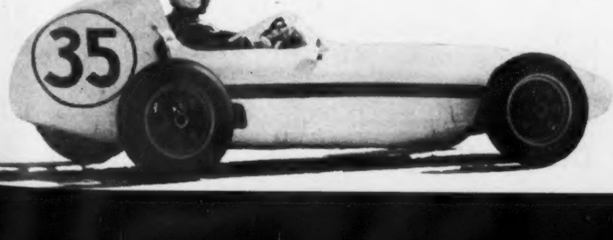
SADLER





DANE

ELVA



YIMKIN

Felix Wankel and his engine may mark the beginning of a new concept in self propulsion.

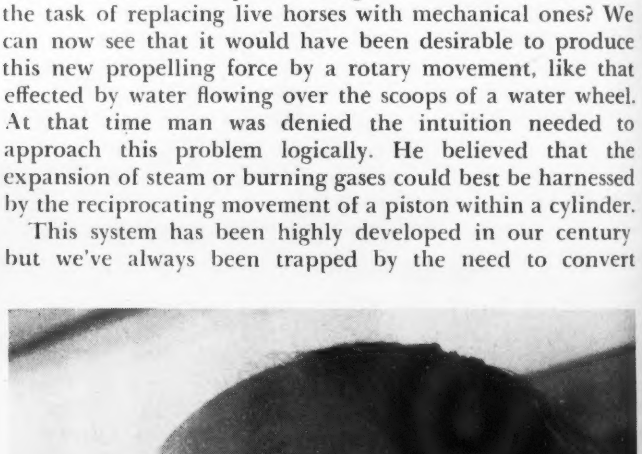
The Man Who Made Tomorrow Come

► New paths to the future can only be broken by men who hate detours. Still little-known to the general public, Felix Wankel is such a man. Born 57 years ago into the family of a forest commissioner in Germany's Black Forest, Wankel has devoted his life to experiments in applied mechanics. It's clear, though, that his childhood association with botany left its mark on him. Throughout his search for technical knowledge he's always striven for simple, direct solutions – like those found in nature. And he's ferreted them out on his own, without reference to the work of others.

Six years ago a group of open-minded engineers concluded that there was still room for fundamental progress in the basic *modus operandi* of the internal combustion engine. Their conclusion was founded on the work of Felix Wankel, who had developed similar opinions three decades earlier. Directly and indirectly he had set about eliminating that frustrating technical inconsistency of our most-used internal combustion engines: reciprocating motion. Fortunately for the rest of the world, Wankel's engineering knowledge may not have been sophisticated enough to lead him to that complex hummingbird – the gas turbine.

As old as man's existence is his desire to travel farther and faster than his feet can carry him. Man ushered in our age of motion by replacing the "reciprocating motion" of his feet with the revolving motion of the wheel. Had the wheel's smooth forward sweep been forgotten when we set about the task of replacing live horses with mechanical ones? We can now see that it would have been desirable to produce this new propelling force by a rotary movement, like that effected by water flowing over the scoops of a water wheel. At that time man was denied the intuition needed to approach this problem logically. He believed that the expansion of steam or burning gases could best be harnessed by the reciprocating movement of a piston within a cylinder.

This system has been highly developed in our century but we've always been trapped by the need to convert



by Dieter Korp

these back-and-forth movements into rotary ones before applying them to the wheels of our personal carriages. To be sure we possess reliable and highly developed piston engines today, but we must acknowledge that "feet" moving back and forth operate under strict limitations. Even now when high engine speeds are needed to produce peak power, or when perfect balance and smoothness are required to enhance reliability, the piston engine must give way to the steam and gas turbines — as in ship, or aircraft applications.

High rpm are the key to extracting more power from the piston engine, but its many reciprocating parts — valves and their operating mechanism as well as pistons and connecting rods — develop great out-of-balance forces which increase with the square of the engine speed. The two-cycle engine succeeds in doing away with the poppet valves entirely, but that's only half the job. As already mentioned the gas turbine provides the rotary motion we need, but its mechanical, thermal and economic problems are considerable (see pages 62-65 — Ed.). This would be acknowledged by well-known automobile factories in both Detroit and Stuttgart who have conducted extensive tests with turbines.

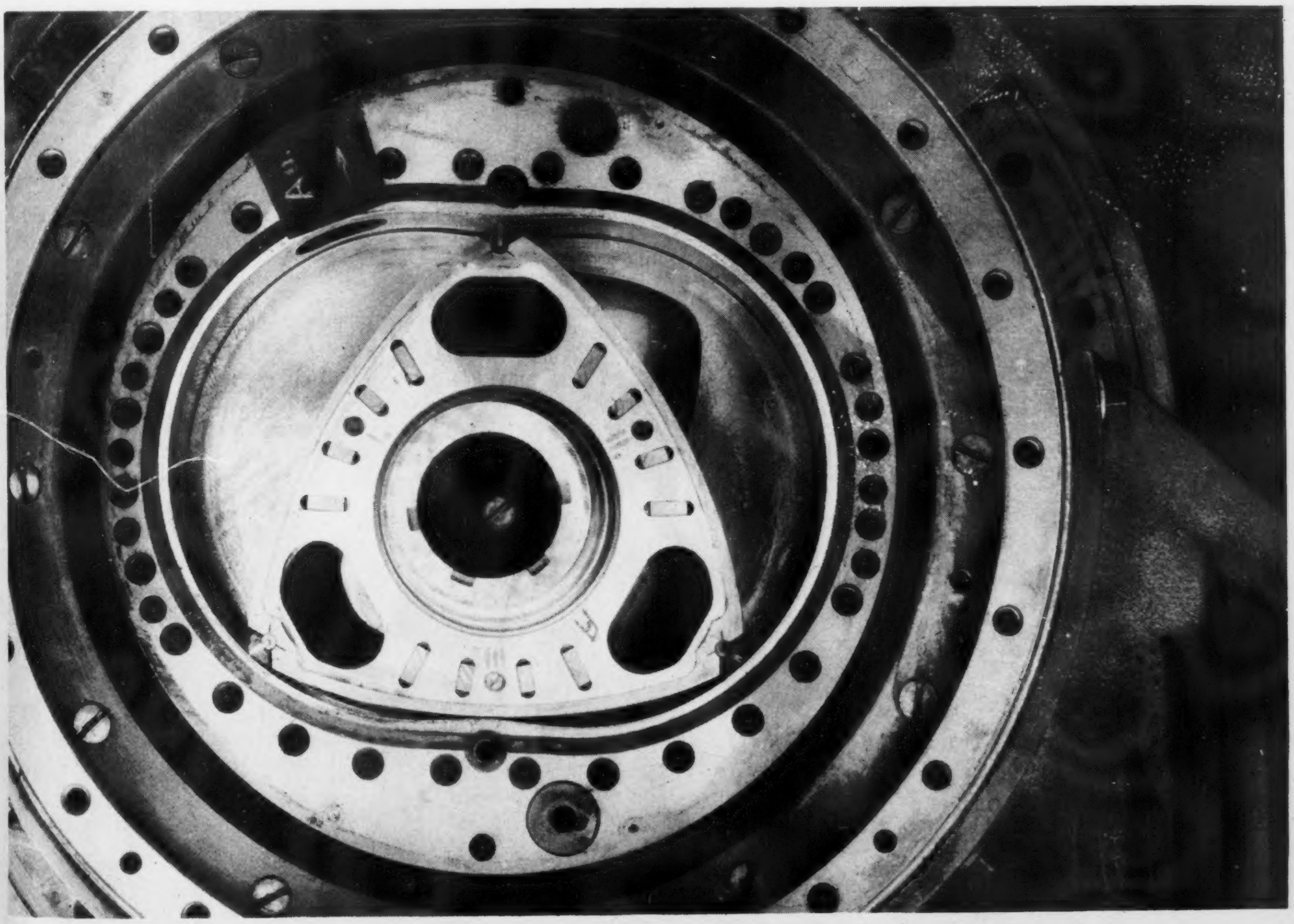
If, in an internal combustion engine, we could allow the power-producing component — the piston, in this case — to rotate or circulate, couldn't the unit be made substantially smaller for the same power and be free from vibration? Wouldn't it be an engine whose rpm could climb almost without limit? But how can a piston possibly be allowed to rotate in this way, forming proper working chambers and causing its engine to inhale and exhale in the proper sequence?

This "how" requires a way of thinking that is superbly space-related and enormously demanding. There aren't just a few types of construction, as in the piston engine, but rather hundreds, as witness the vast number of patents applied for in the past century and a half. If the researcher didn't smother in the morass of possibilities, he had to surrender before yet another obstacle: the problem of sealing the meeting surfaces of an oddly-shaped piston and a surrounding housing or another rotating body in contact with this "piston". Undoubtedly, this sealing problem was one of the reasons why the piston engine has developed so persistently and unreasonably, for it's possible to seal the circular gap between the piston and the cylinder wall exceedingly well by a simple piston ring. Even engineers are sufficiently human to follow the line of least resistance.

Few of these specific problems had materialized in 1902, when Felix Wankel was born in Lahr/Schwarzwald. His father, Rudolf Wankel, was killed in the war when Felix was 12, and the young man was then cared for by his mother, born Gerty Heidlauff. He attended elementary school until 1921, when his family's funds vanished in the inflation, forcing Wankel to learn salesmanship as a dealer in scientific books for a publisher in Heidelberg. In '24 he set up a private experimental workshop in the same town, and by 1926 he was able to stop selling books and concentrate on engineering work.

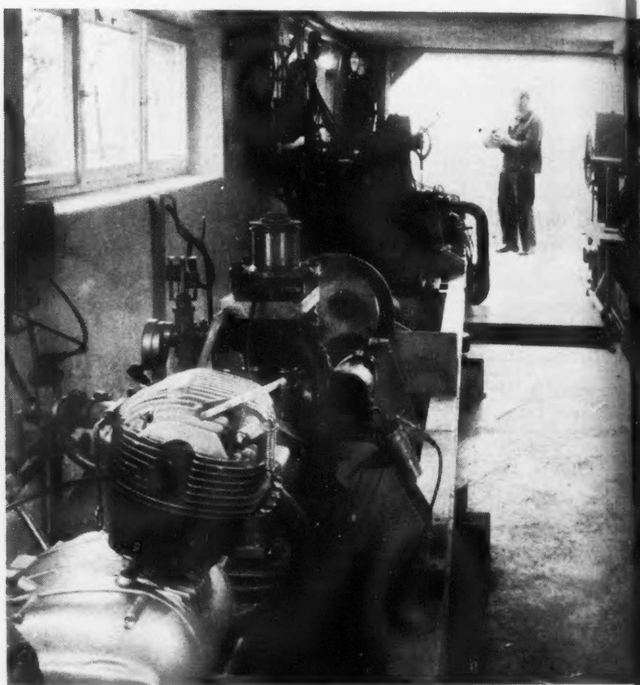
In the latter year, after he submitted suggestions for improvements in sealing to a firm making high-pressure lubrication equipment, Wankel realized that new kinds of sealing methods could also bring new kinds of engines to life. This concept was the crucial one, though it was only one isolated idea in a broad research program. When in 1927 he also put on paper his first sketches of rotor-type engines, it was quite clear to him that success could lie only in solution of the problem of sealing the surfaces involved under conditions of high wiping pressures and speeds.

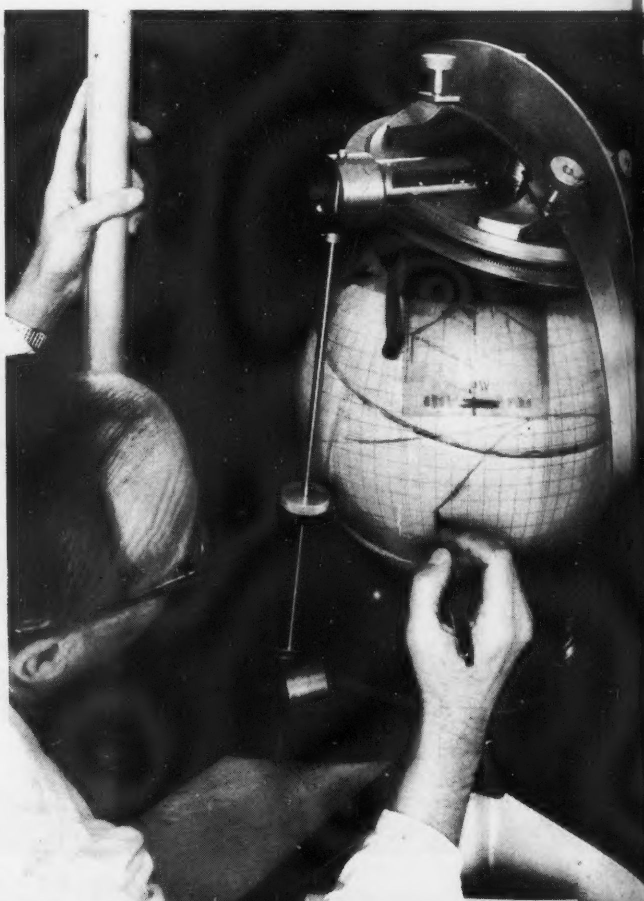
The same sealing problems also arise in the use of rotary valves for piston engines. When he set up a test chamber with stands for motorcycles, in 1928, Felix Wankel intended to put his knowledge of sealing systems to work in what he hoped would be a successful rotary valve. Once this had been solved, the know-how accumulated had to be useful in the



PHOTOGRAPHY: WEITMANN

Dr. Wankel's interests are not limited to engines. Here, he explains his catamaran sailboat that features true airfoil sails, and hydrofoils. A complete engine test house (below) has been set up in what was once Dr. Wankel's boathouse. Two Max model NSUs are under test—one with rotary valve head.





The dining room of Dr. Wankel's home has been converted into a drafting office, complete with drafting machines. A special Wankel calculating machine (right) is used by him to plot the complex curves needed to construct his revolutionary engine.

design of a workable rotor engine. It's important to note that this was the sequence followed: First, experiments with sealing systems. Second, construction of a practical rotary valve. Third, creation of a rotor engine. If the engine had been conceived first, as a naked idea without integration of the sealing methods, its chances for survival would be as slim as those of engines that have preceded it. But this power unit followed logically upon the solution of the sealing problem.

From 1929 through 1931 Wankel developed and built 20 devices to test rotary valve principles, succeeding in propelling a motor cycle with a disc-valved engine and in running a test engine with a cylindrical rotary valve. The next two years were spent in evaluating the test results and in applying for patents, pleasant labor which was halted on March 14, 1933, when Wankel was imprisoned on the orders of the Baden district leader of the National Socialist party. It seems that he had dared to withdraw from the party out of disappointment over the corruption of the Nazis. His release on September 21st was effected by Nibel, chief engineer of Daimler-Benz, and by secretary of state Keppler, who had heard about Wankel's scientific experiments. He was further reinforced by a contract with Daimler-Benz for research into sealing components, rotary valves and rotor engines, but this was dropped following a conflict with the opinions of the D-B general director, and was replaced by a similar contract with BMW in Munich. At the same time, in 1934, Wankel's workshop was moved to Lahr/Schwarzwald.

In 1936 the Air Ministry heard about Wankel's efforts and invited him to continue his work at the Deutschen Versuchsanstalt für Luftfahrt (DVL) at Berlin/Adlershof. Wankel declined, whereupon air minister Göring arranged to have a separate institute set up for him – the Wankel-

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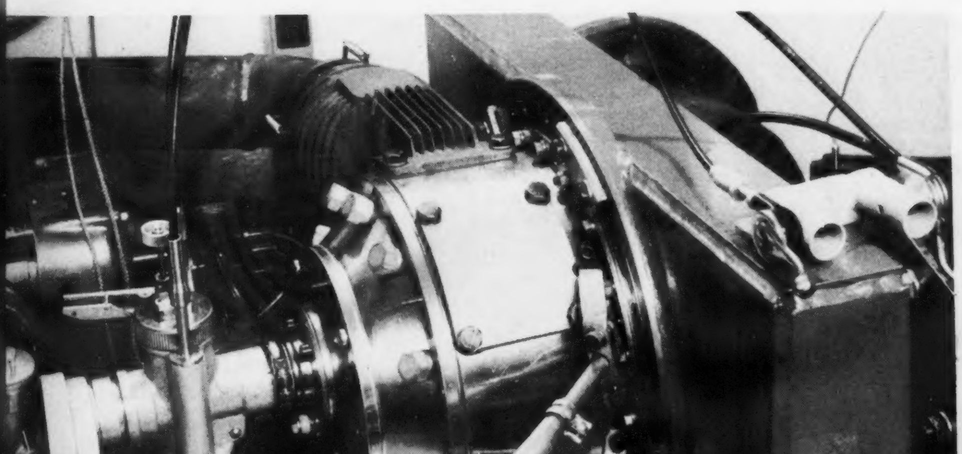


Prototype version of the Wankel engine being put through its paces in the boathouse test lab. This early engine had the figure-eight casing and piston rotating in same direction.

ROAD TEST: HILLMAN EASIDRIVE

► On the basis of sound construction, conventional mechanics and appealing styling Hillman cars have sold very well in the U. S. since the war. Hillman was, in fact, one of the first British makes to enter the American market on any scale, and Rootes Group executives thus have an unusually good grasp of what will appeal to us—on a general level, as well as on the sporting level exemplified by the Sunbeam Alpine from the same company.

But now Hillman has the means to do *extremely* well in America, if their production and distribution facilities are up to the job. For they are the first in their size class to offer a device dear to the hearts of drivers in all countries—but especially in America: an automatic transmission. Not an automatic clutch or fluid coupling, or any other compromise, but a fully automatic gearbox that out-thinks and outperforms most others of its breed.

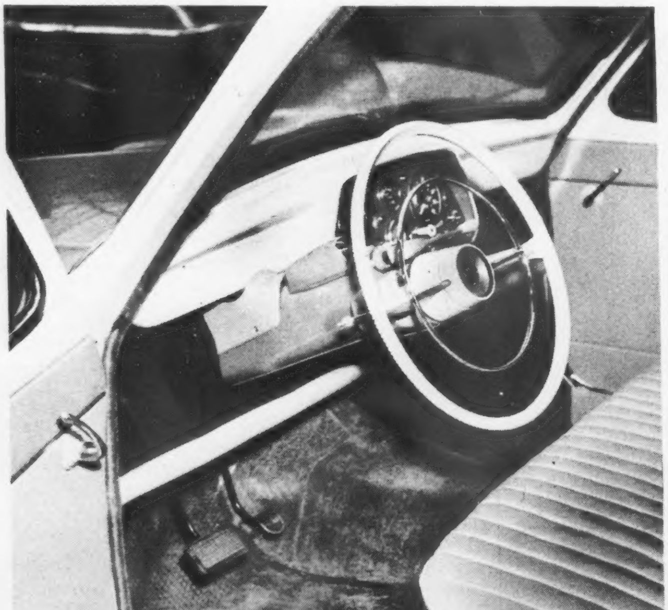
Suitably enough the basic idea that made this possible originated on the American continent, in the mind of a Mr. Jacob Rabinow. His was the discovery that power could be transmitted between two rotating parts if a magnetic powder between them was "energized" by a magnetic field. World-wide basic patents to this idea are held by the Eaton Manufacturing Company of Cleveland, who have granted a license for all continents except North America to S. Smith and Sons, Ltd. in England. Smiths in turn sublicensed the powder clutch to Jaeger in France, who pioneered its use as a semi-automatic clutch system on several French cars. In the meantime engineers at Smiths developed the Selectroshift automatic clutch system and finally the Autoselectric fully automatic box, which makes use of two powder clutches. In much-refined form the Autoselectric is now being marketed by Rootes as the Easidrive, available on the Hillman Minx Series IIIA and perhaps later on other Rootes models if demand warrants it.

The Easidrive's two magnetic clutches are arranged to drive through a mechanism which generally resembles a three-speed transmission. There's no direct-drive dog clutch, though, this job being done by one of the powder clutches. The other, rearward, clutch carries torque to the reduction-gear section of the box. When the car's started from rest the low gear set is driven through a free-wheel, which allows first to be over-run when second is automatically selected. This latter is done by a solenoid which engages the blocked but not synchronized second gear set, aided by the direct-drive clutch which is engaged momentarily to pull the engine speed down. The final change from second to top is managed by switching from one clutch to the other while second gear is disengaged. Going back down the sequence is similar. First gear doesn't come into play again unless the car comes to a halt or the throttle is depressed at very low road speeds—say below 15 mph.

Starting up from rest is fundamentally dependent on the gradual increase in generator output as the engine speed rises, but in practice this is modified by the control system to give a sudden voltage increase right around the rpm of peak torque—2000 rpm in the case of the Hillman. Thus "slip" is allowed to take place only until the engine reaches the speed at which it can handle the job on its own. After that the powder coupling is locked up to provide a connection that is *absolutely without slip.* The action is akin to that of a normal clutch and gearbox, then, with the exceptions that chatter or stalling are impossible and that the gear-to-gear changes are remarkably smooth.

To ensure that no forward creep can take place, a switch is connected to the throttle linkage that cuts off all current to the clutches at idle. Positive operation of this switch is guaranteed by about ½ an inch of initial free play in the accelerator travel, a feature that's initially disconcerting but easily adapted to. With the column-shift-like selector level in "D," the Hillman moves away in low ratio. It can shift to second at as low a speed as 12 mph or as high as 22, depending on the throttle position. At full throttle the upshift is a leisurely

Wide brake pedal of Easidrive-equipped Hillman allows left-foot stopping. Other assets—handy hand brake, wide package shelf below dash.



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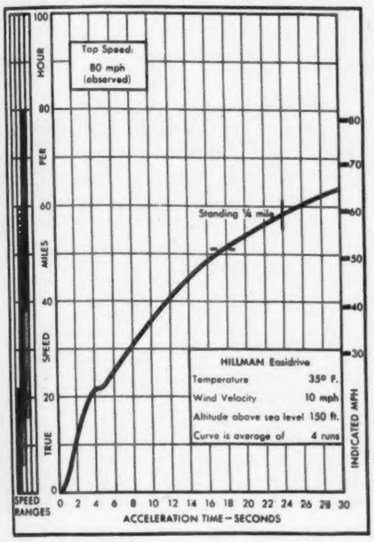
ROAD TEST

HILLMAN Easidrive

Price as tested:	$2169
Importer:	Rootes Motors, Inc. 505 Park Avenue New York 22, N. Y.



ENGINE:

Displacement ....91.2 cu in, 1494 cc
Dimensions ....Four cyl, 3.11 x 3.00 in
Compression Ratio ....8.5 to one
Power (SAE) ....56½ bhp @ 4400 rpm
Torque ....83 lbs-ft @ 2000 rpm
Usable rpm Range ....800-5100 rpm
Piston Speed $\div \sqrt{s/b}$ @ rated power ....2240 ft/min
Fuel Recommended ....Regular
Mileage ....19-26 mpg
Range ....165-230 miles

CHASSIS:

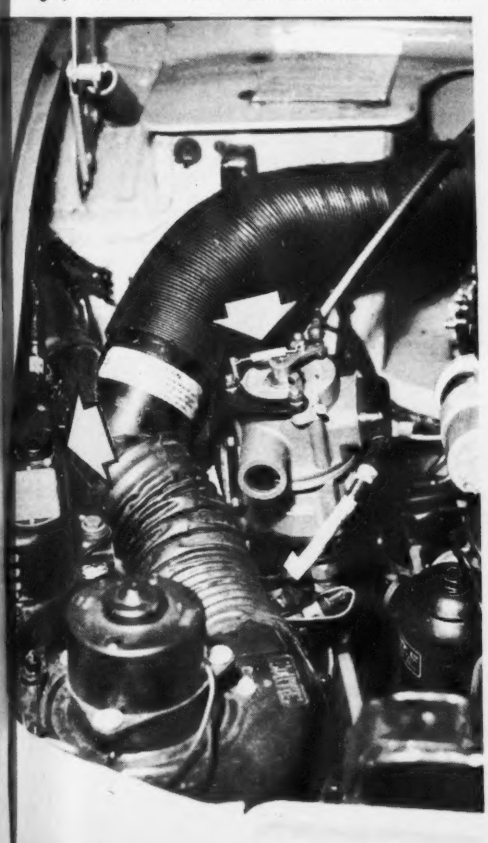
Wheelbase ....96 in
Tread, F,R ....49, 48½ in
Length ....162 in
Suspension: F, ind, wishbones, coil springs. R, rigid axle, leaf springs.
Turns to Full Lock......................................1¾
Tire Size ....5.60 x 15
Swept Braking Area ....121 sq in
Curb Weight (full tank) ....2420 lbs.
Percentage on Driving Wheels 42%
Test Weight ....2780 lbs

DRIVE TRAIN:

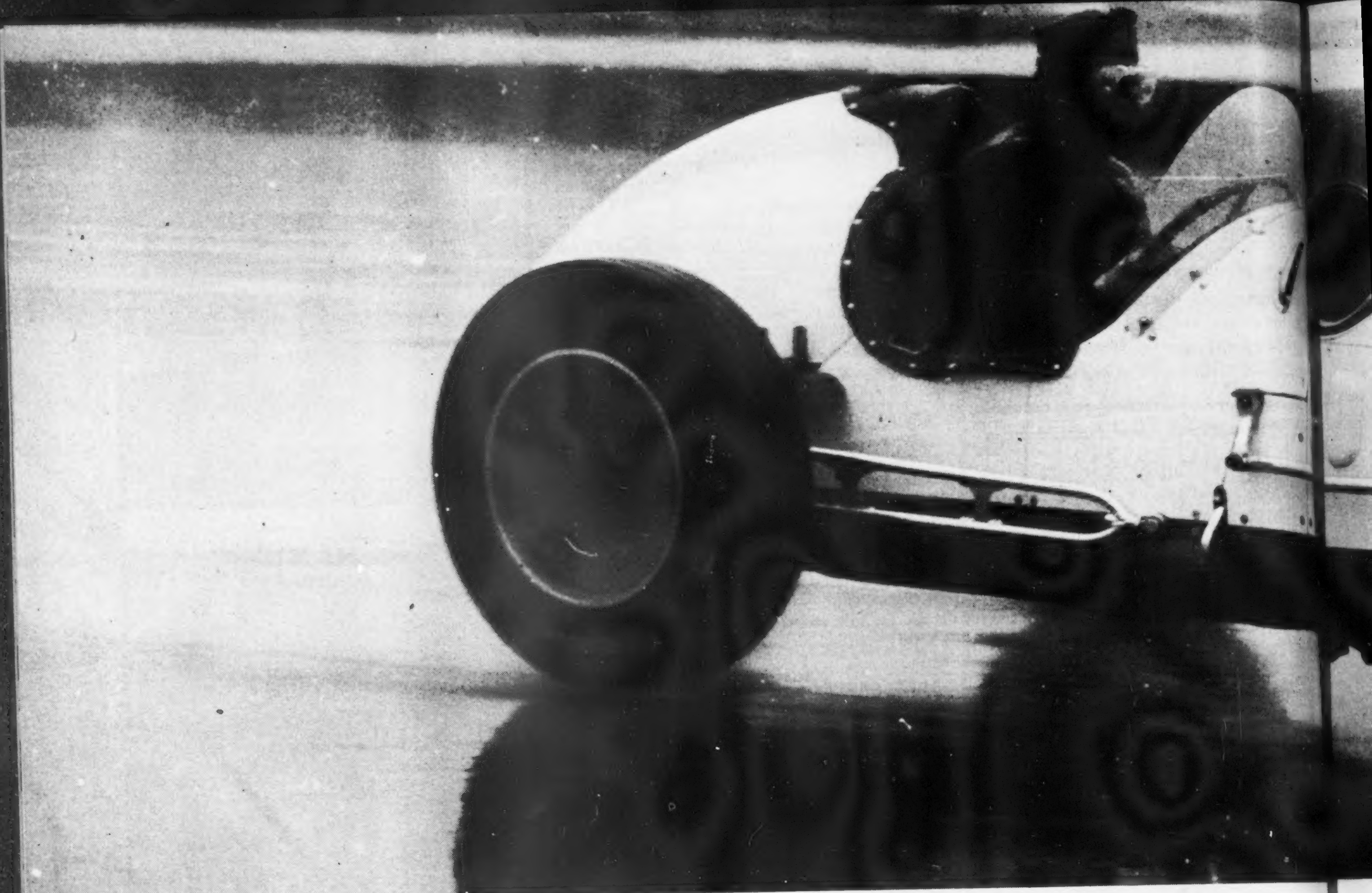
Gear	Ratio	Step	Overall	Mph per 1000 rpm
Rev	3.08		14.01	5.2
		n/a		
1st	2.97		13.53	5.4
		87%		
2nd	1.59		7.24	10.0
		59%		
3rd	1.00		4.55	15.9

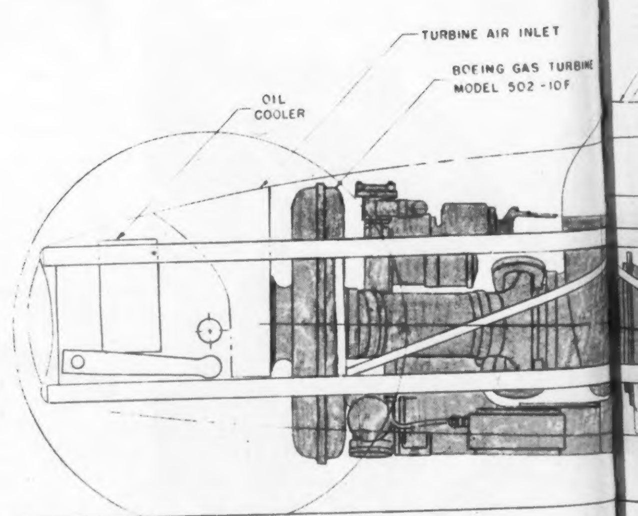
Final Drive Ratio: 4.55 to one

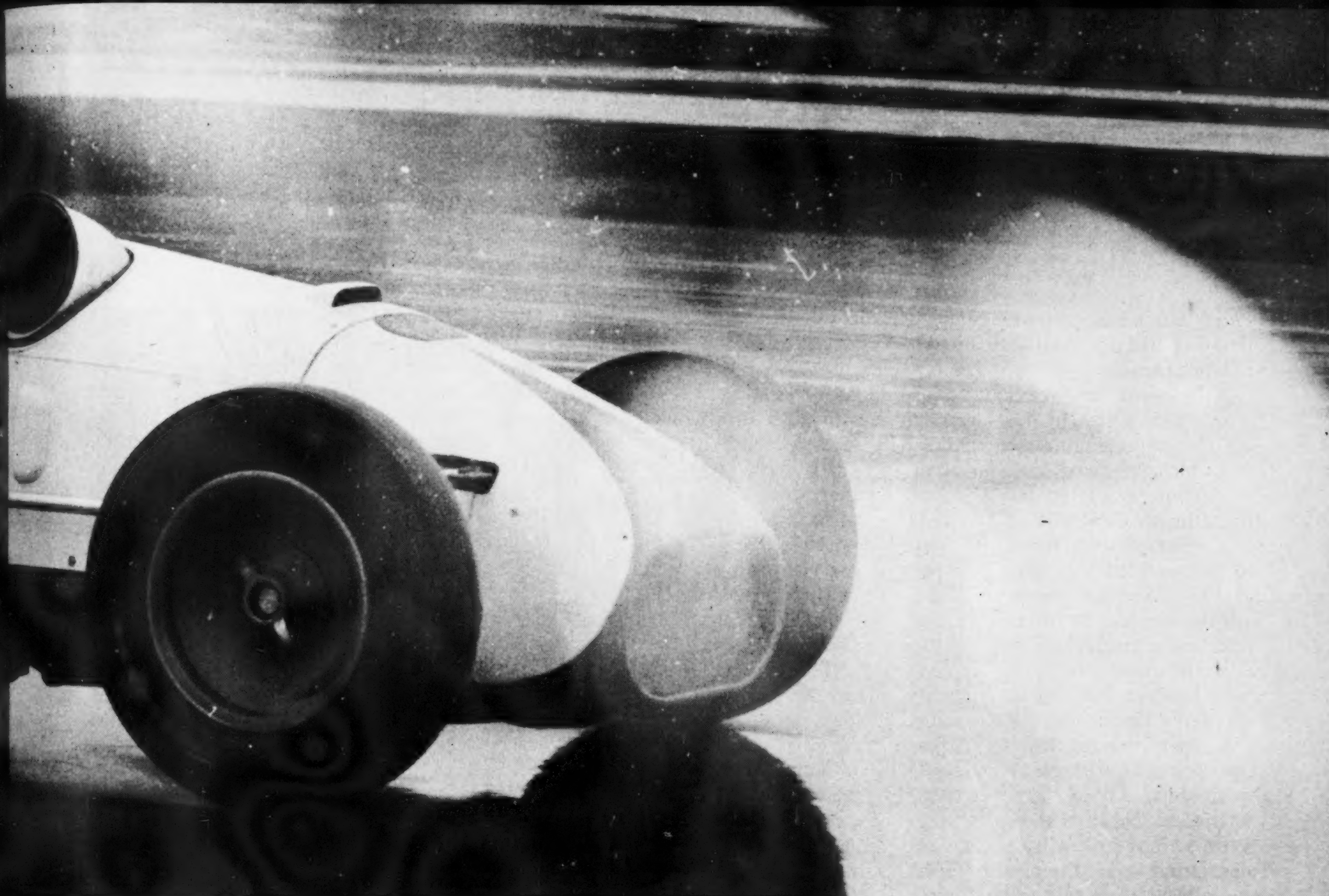
Hose from heater blower separates governor, at right, from black control box under fender at left.



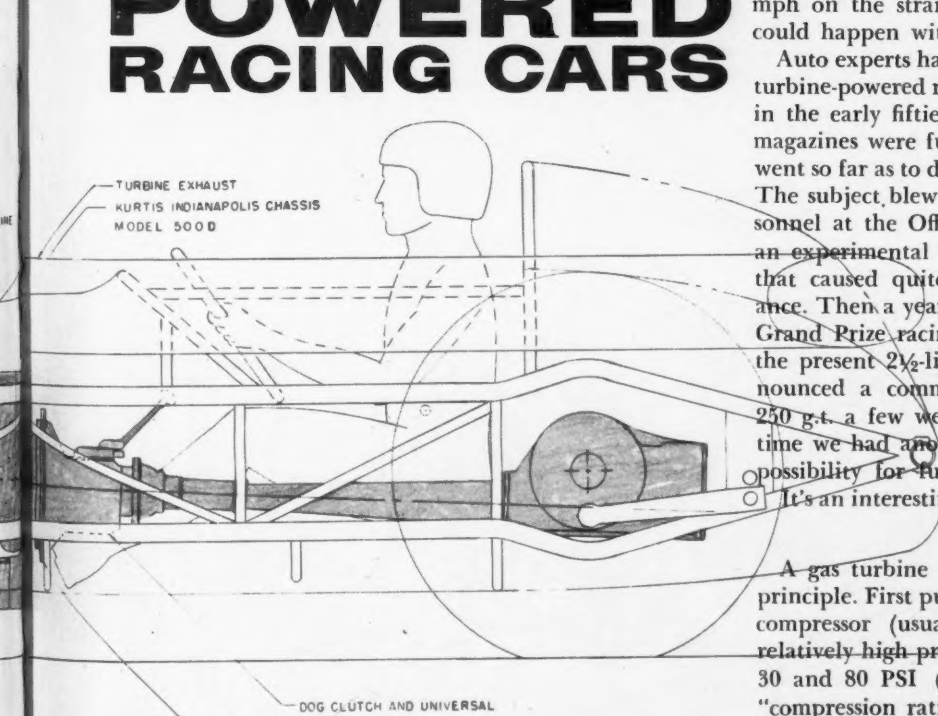
As befits a family car, the Hillman's trunk space is exceptional. Spare tire, easily removed, hides neat clips for jack and crank which doubles as jack handle. Opening knob is hard to reach.




TURBINE AIR INLET
BOEING GAS TURBINE
MODEL 502-10F
OIL
COOLER



TURBINE POWERED RACING CARS



by Roger Huntington

► Imagine a Formula 1 G.P. car that packed a solid 400 horsepower on a dry weight of 800 pounds, would do 220 mph on the straightaways and accelerate like a rocket. It could happen with a gas turbine engine.

Auto experts have been predicting the early appearance of turbine-powered racing cars for at least eight years now. Back in the early fifties there was a flurry of interest. The auto magazines were full of speculation, and F.I.A. officials even went so far as to discuss a classification system for g.t. engines. The subject blew hot and cold after that. In 1955 SAC personnel at the Offutt Air Force Base near Omaha built up an experimental Kurtis race car with a Boeing g.t. engine that caused quite a stir—and showed promising performance. Then a year ago we heard Mercedes-Benz might enter Grand Prize racing again with a gas turbine engine when the present 2½-liter formula ran out. So when Allison announced a commercial version of their advanced Model 250 g.t. a few weeks ago, Editor Ludvigsen thought it was time we had another good look at this form of power as a possibility for future road and track racing machines.

It's an interesting story . . .

HOW DOES IT WORK?

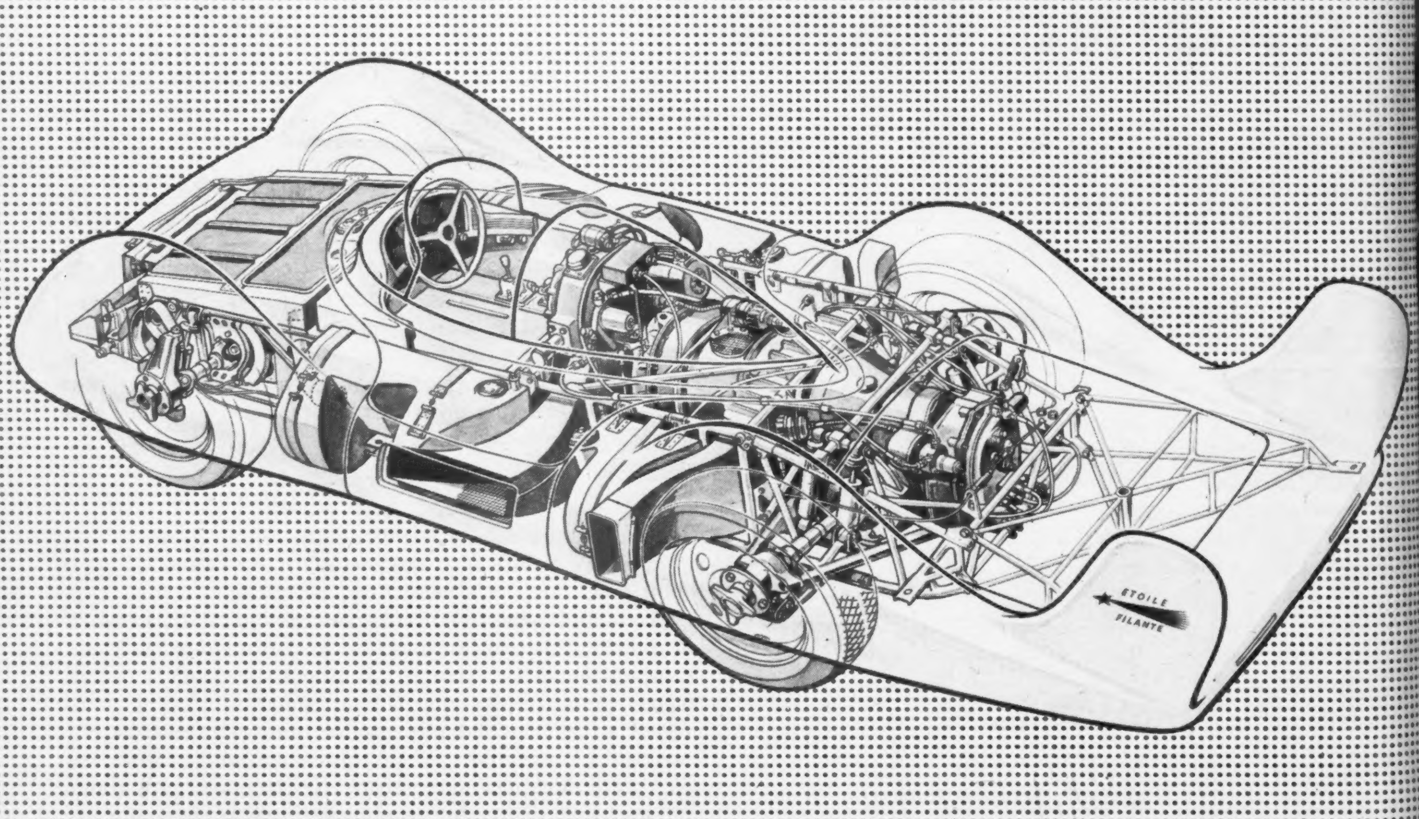
A gas turbine engine is ridiculously simple in operating principle. First pure air is compressed in some form of rotary compressor (usually a centrifugal or axial-flow type) to a relatively high pressure and temperature—generally between 30 and 80 PSI (gauge) and 250 to 550 degrees F. These "compression ratios" require rotational speeds of 30,000 to 50,000 rpm on these inertia-type compressors. The compressed air is then fed into one or more burners where a low-grade kerosene-type fuel is sprayed in and combustion takes place. The gas temperature rises to somewhere about 1400 and 1800 degrees on combustion—and from here it expands through the first turbine, which drives the compressor. This is usually an axial-flow wheel with many individual

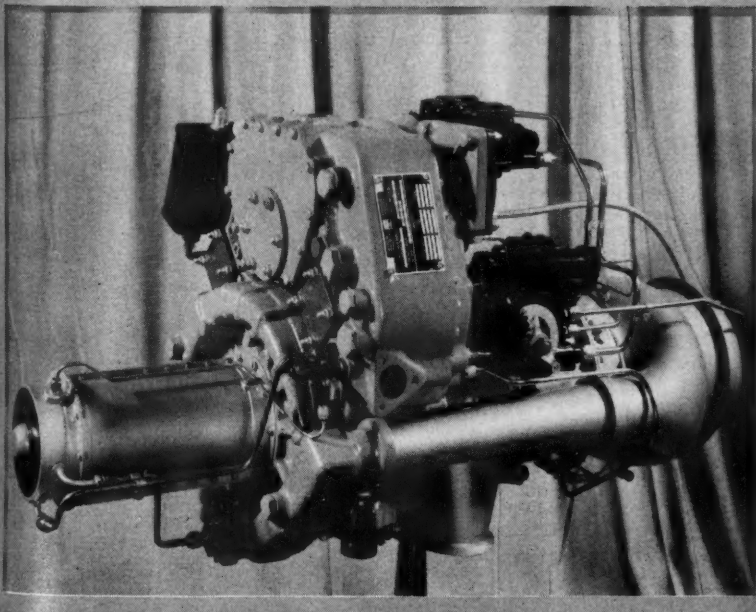
blades, but some g.t. engines use a radial inflow turbine, operating like a centrifugal supercharger in reverse. These are much cheaper.

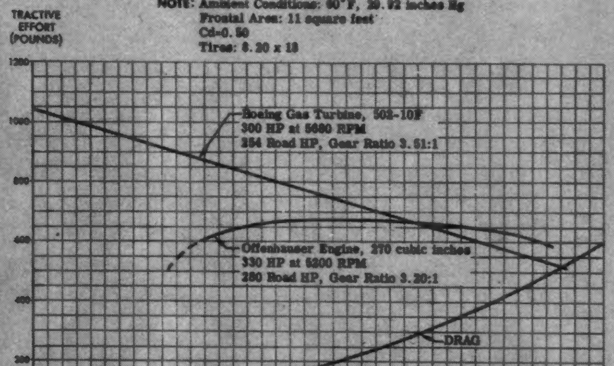
At this point the hot exhaust gas could be jetted rearward to give a direct thrust, as on an aircraft turbojet engine. But on our g.t. engine we expand it through a second turbine which is geared down to drive an output shaft, so we get our energy in the form of shaft torque rather than a direct thrust. Generally this second, or "power," turbine is on a separate shaft from the compressor turbine, so they are not coupled together. This permits the g.t. engine to develop maximum torque when the output shaft is stalled, with the compressor running at maximum speed. This is an important characteristic that you should remember. Exhaust gas temperature leaving the power turbine will fall to somewhere between 900 and 1200 degrees, due to the expansion and energy loss through the two turbine stages.

At first glance it might seem that a g.t. engine would be very efficient—burning a relatively small amount of fuel for the amount of power produced—because we have so much less friction loss than in a piston engine. Actually there are several serious strikes against it. For one thing the effective compression ratio (the pressure built up by the compressor) is usually below 4 to 1—which has much the same harmful effect on efficiency as in a piston engine. Furthermore we can't "burn" all the air that is compressed. If we fed in enough fuel to give the theoretically-correct air-fuel ratio of around 16 to 1 the combustion temperature would shoot up near 4000 degrees—and the turbines would disintegrate in a second. So we have to by-pass much of the air to lean out the air-fuel ratio to somewhere between 60 and 100 to 1 to hold turbine temps near 1500 degrees. This, of course, means most of the air compressed is just washing through the engine for cooling, and the fuel necessary to pump it is wasted. Finally, a lot of heat energy goes out the exhaust, as it does on most heat engines. If we could recover some of this . . . but this brings us to methods for improving the efficiency of the g.t. engine.

The major routes should be obvious: (1) Raise the compression ratio, (2) raise gas temperatures at the turbines, and (3) recover heat from the exhaust gas and recycle it back to the compressed inlet air. Much progress has been made in all these areas in the last six or eight years. For instance Boeing has developed a single-stage centrifugal compressor that pumps a compression ratio of 6.5 to 1 at a rotor tip speed of 1750 feet per second—which is said to be the highest ever achieved with this layout. The new Ford experimental Model 704 g.t. uses a two-stage centrifugal compressor section that pulls 4 to 1 in each stage, for a total effective compression ratio of 16 to 1! This is better than our best aircraft axial-flow compressors, which operate up to about 13 to 1. *(Continued on page 80)*







COMPARISON CURVES
TRACTIVE EFFORT vs. MPH

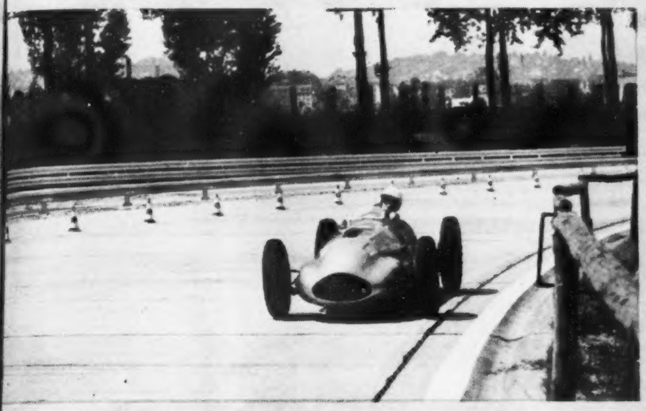
The Shooting Star, turbine-powered experimental vehicle, (above left) was a technical exercise on the part of the Renault Company. Not intended for road racing, the Star did set some straight-line turbine speed records. The Allison Gas Turbine engine (left) produces 250 hp and weighs only 100 pounds. Fuel consumption, however, is 27 gallons an hour. Graph (above) shows how turbine produces greatest tractive effort just at take off.

Even a banked curve becomes a bit difficult when you have upwards of 480 hp on hand. Here, the W 163 is gently guided around the banking on the M-B test track.

Track Report: Paragons Revisited

by H. U. Wieselmann

"Now remember, don't let your right foot slip." Here, Wieselmann is given last minute instructions before being pushed off in one of the 1939 Mercedes-Benz GP cars.



Built in secret for the 1939 Tripoli race, the 1½-liter V8s proved a shock to the Italians by coming in first and second in a contest that had been tailored to fit the Latin hardware.

▶ During the present fallow period of factory-sponsored racing at Mercedes-Benz any and all devices are used by the keen types of the competition department to keep the flame burning. One such excuse was provided by a recent visit of the Duke of Kent to the Mercedes Museum.

For the Duke's edification—not to mention the sheer delight of all the M-B people who like the smell of doped fuel, and the sound of an engine going past five thou—Daimler-Benz had five GP cars warmed up and ready for demonstration runs. They were: the 1914 4.5-liter four-cylinder, the 1937 5.6-liter eight-cylinder, the 1939 3-liter V12 and 1.5-liter V8, and the 1955 2.5-liter straight eight. The assembled cars represented the past Grand Prize racing history of the firm. Mechanics filled tanks, started engines, and switched to hot plugs as the different power plants reached racing temperatures. Rudolf Uhlenhaut, who had invited me to take part in the demonstration, took off first in the the monster 646 bhp V12.

Fast laps were to be driven on the new Daimler-Benz test track that runs along the Neckar River. This circuit consists of two straights and four curves. The turn with the longest radius curls around the skid pad, and is rather steeply banked. On the other end is a hairpin. This is a very slow corner—under 50 mph—due to built-in bumps for test work and the natural tightness of the turn itself. After the hairpin is a left bend which leads into a 200-yard straight. At the end of this straight is a very fast left hander which leads back into the banked turn.

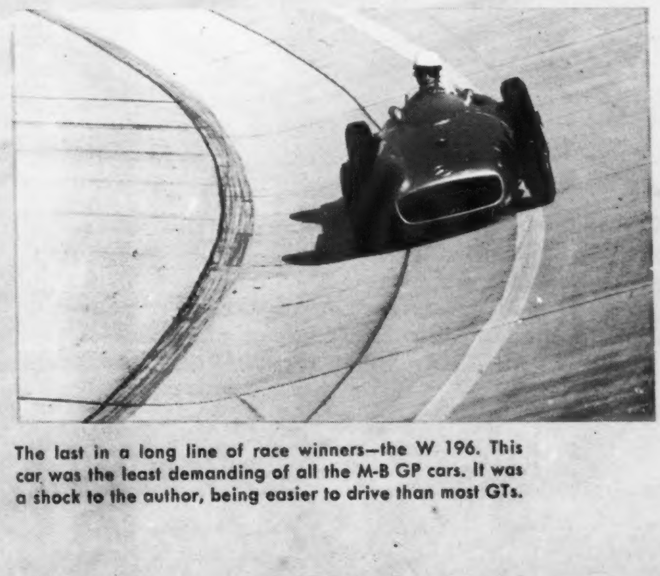
The scene in the impromptu pit area, what with the shrieking of superchargers and the aroma of burnt alcohol fuel, recalled powerfully the great days of Mercedes Grand Prize racing. To heighten the effect the cars were being cared for by the same mechanics who had helped make Carraciola, Lang, Kling, Fangio and Moss invincible on the world's racing circuits.

As background music Uhlenhaut was lapping with the W125—the most powerful road racing car ever built. When he came in—all smiles and acting like a little boy who had been let loose in a toy shop—he asked me "Would you like to try the fat one now?"

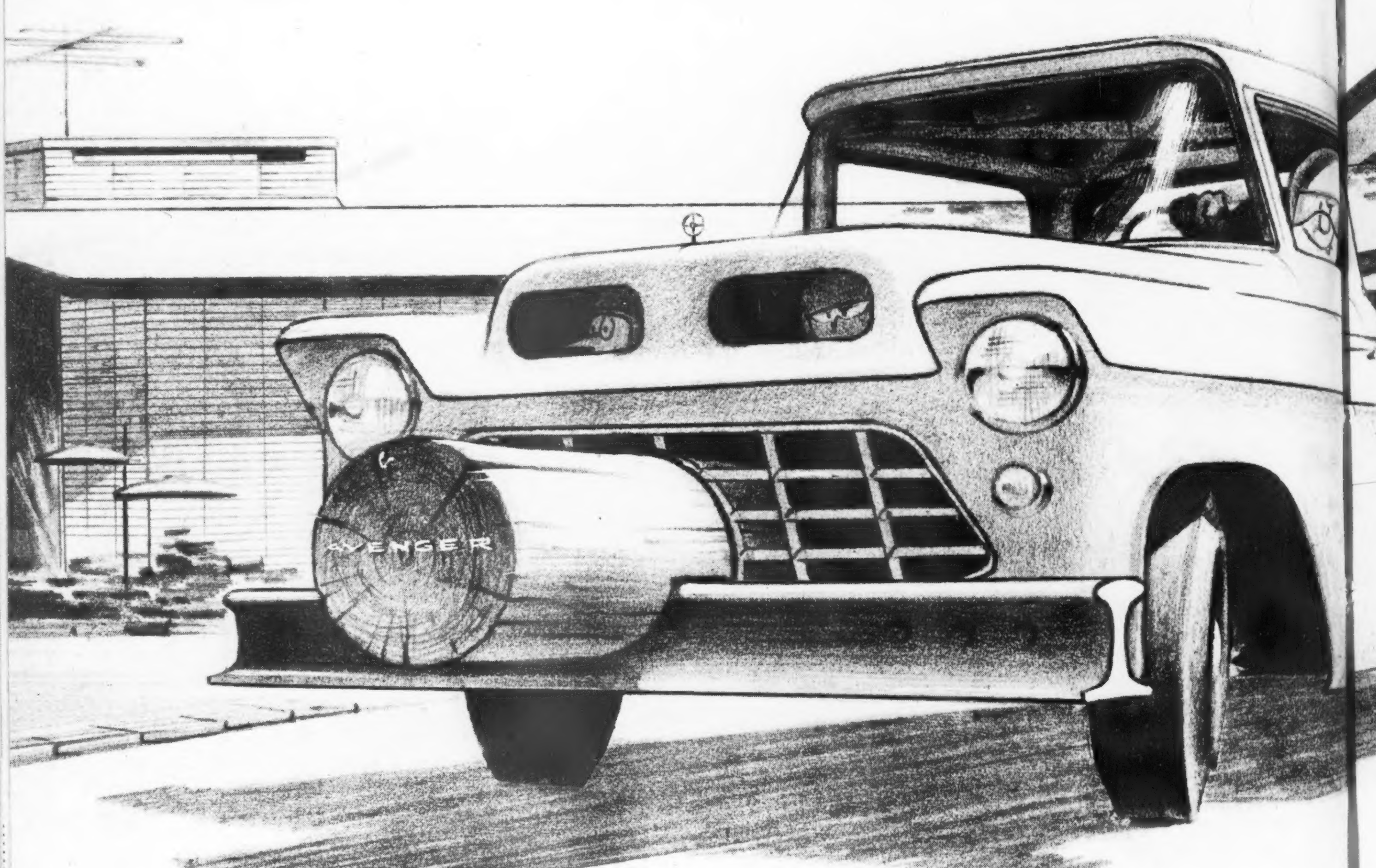
If Ingemar Johansson could be considered overweight, then you might call the W125 fat. Built according to the 750 kilogram formula that was valid from 1934 to 1937, the W125 has trouble delivering its 646 horsepower to the road. Second gear, which is selected as you're pushed off, is good up to 110 mph, but the potent 5.6-liter supercharged engine is so flexible you can move away without difficulty at 25 mph. This corresponds to about 1250 rpm with the gearing being used for the demonstration runs. Constant straight-line acceleration requires the right foot of a ballet dancer. Any hamfootedness is instantly translated into rapidly rising revs which very quickly overcome the traction of the back wheels. Result: prodigious wheel spin. As long as the front wheels aren't turned this is a relatively harmless, but impressive, experience. It's otherwise if you find yourself emerging from a corner or actually in the curve proper—then the back of the car is forced outward as if you had been hooked by a giant angler. Instant correction is necessary if you and the car intend to stay on course.

This is easier said than done, however, in this pre-war Grand Prize car. Built to accommodate the old school of GP drivers, the wheel is situated so close to the seat that it makes an elbows-out position mandatory. High steering forces also tend to make a modern driver uncomfortable. Once these not-so-minor points are taken into consideration, high adventure awaits the curious. You cross the threshold into a land of pure speed when you come off the banking and accelerate hard in third gear. When I crossed the border it felt as if a gigantic force pulled me forward—a force that was completely alien to present-day GP drivers. Where it came from was easy to calculate afterwards. With the tanks a

(Continued on page 85)



The last in a long line of race winners—the W 196. This car was the least demanding of all the M-B GP cars. It was a shock to the author, being easier to drive than most GTs.



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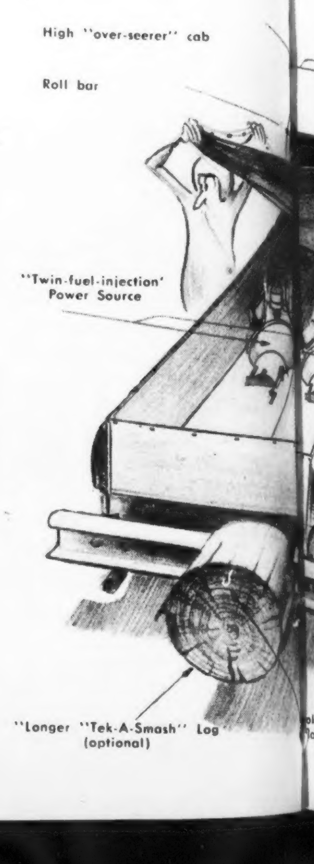

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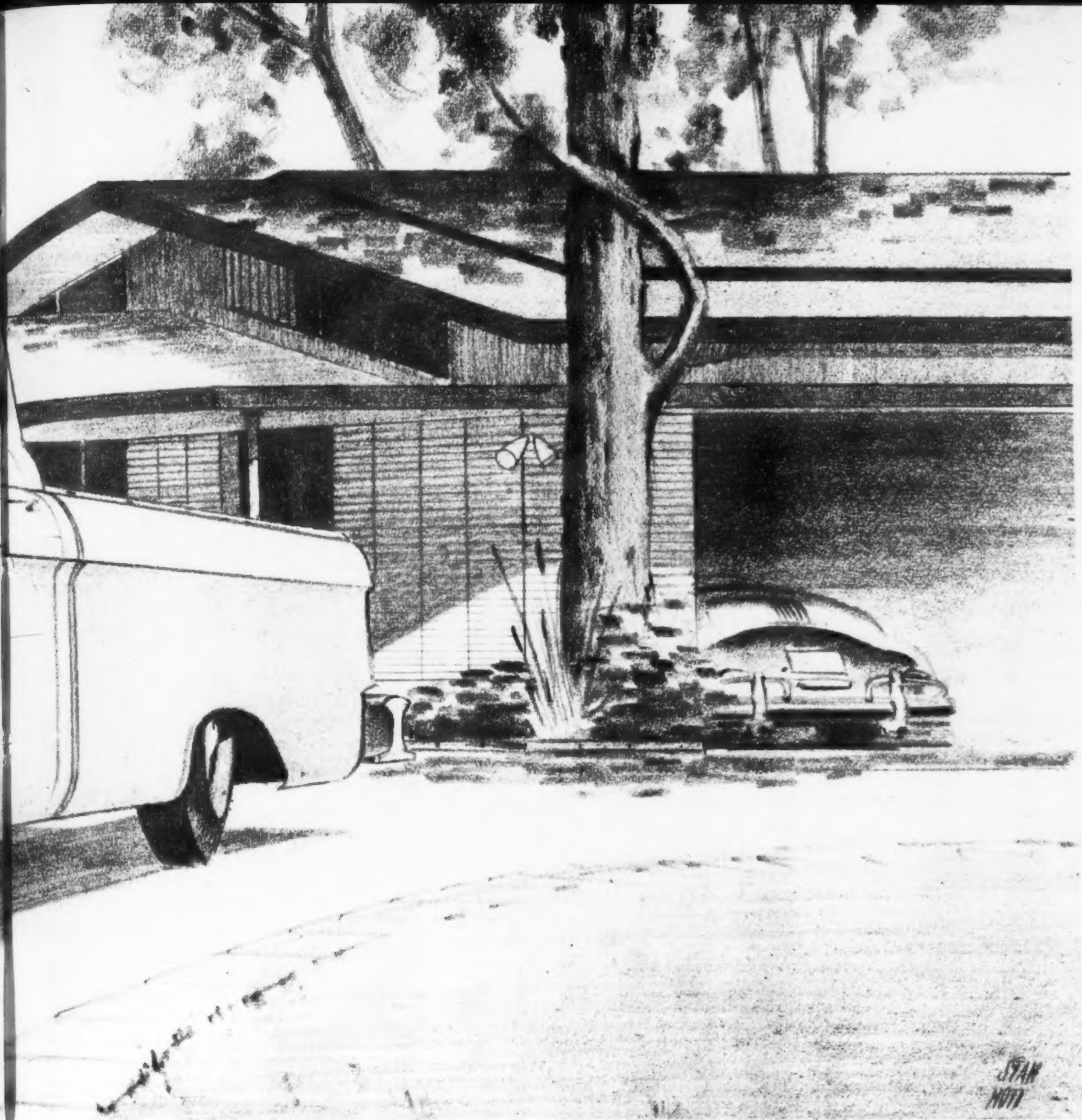

Sam Thud takes his friends out for a spin in his new AVENGER SPORT COUPE MK 1.

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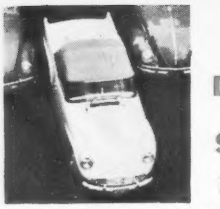


Daimler SP 250

from page 51

as we opened it and splashed into the previously dry compartment. If the lid had internal hinges, its front edge would move *forward* and up, so that all water would spill on the body instead.

When we first met the Dart, as it was known back in April 1958, we expressed our disappointment in the body styling. We were told rather pointedly that the now-best-selling sports car in the USA was hardly a beauty itself and besides, there were a good number of people who disagreed with our opinion. This is one aspect of a car which can be best covered pictorially so we will leave it at that, except to say it attracted a great deal of attention wherever we went.

As to quality of finish, the Daimler's fiberglass body is about on a par with that of the Corvette, though it is much lighter. The only shortcomings we noticed were in the doors. Though well-aligned for ordinary closure, their hinges didn't seem very rigid. Around the slot in the door for the window, small cracks appeared, indicating that the fiberglass cloth should have extra layers there. All openings matched well and the push-button latches worked easily.

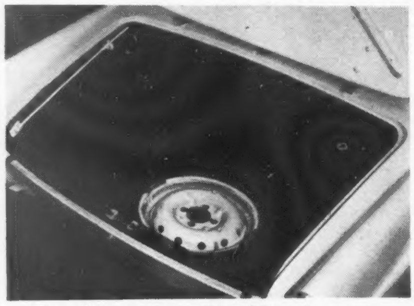
The SP250 is intentionally a very simple sports car. It utilizes common, garden variety, British-built components so that despite its low-volume production and therefore limited sales and service force, minor repairs will be feasible at almost any British car dealer in the country. The one extravagance is the engine.

Our first driving impressions were gathered in Manhattan's midtown traffic. Though taken aback by the heavy steering and choppy ride, we were overwhelmed by the smoothness of this high output engine. The car will pull easily, though not strongly, from half its idle speed! Not for the first time, we have the anomaly of a light car, which gets along with a high first gear, being equipped with a close-ratio four-speed gearbox. Alongside the acceleration graph, the plot of speeds attainable in the various gears shows that it is quite feasible to drive the SP250 using only first and fourth. But the manufacturers offer what the public demands, so there will soon be an overdrive option too. The only real advantage that this will confer is a mild degree of automaticity without the stigma of the other option, the Borg-Warner automatic transmission. Neither is yet available in the USA.

The trunk lid is very light and the prop is not necessary to hold it open as the hinges are relatively stiff. It also can be leaned forward against the top for full exploitation of the 25½ by 36-inch opening. The inside measurements range from 56½-inches wide (fender to fender) to a minimum of 20-inches deep, also in the fenders.

The spare wheel and two tool kits are under a false floor, making it easier to use the space above. The jack works through a hole in the floor in front of either seat and engages a bracket on the side of the frame.

The gas filler is centered in front of the trunk, the tank itself being directly above the rear axle so that the trunk can be so deep. In trying to fill the tank to the very brim for our mileage checks, the attendants usually let it overflow. Fuel ran all over the rear bodywork, though fortunately not into the trunk itself.



The alligator-type hood also has external hinges and a prop to keep it up. The release is in the cockpit and requires a very firm pull. A safety latch at the front lets it open wide and access to the engine is very easy. The dipstick is at the left front and the oil filler is between the generator and the right valve cover (though no oil was added in over 1200 miles). The low, cross-flow radiator requires a small header tank next to the dipstick. Because the heater is higher still, the engine must be stopped before the cap is removed; otherwise the heater system will be pumped dry.

In parking the car, the rear fins make reversing a cinch, but the low nose is longer than we guessed, and we "kissed" bumpers twice. Though they look too low, the bumpers and bumper guards do their job of protection. The ridges which lead into parking lights make it easy to judge the front fender's position.

The three inch-wide clutch and brake pedals are well separated, there being some twenty inches of width for one's feet. All pedals are pendant. The tip only of the narrow (one inch) accelerator is about three inches forward of the brake pedal, making heel and toe technique difficult unless you bend the accelerator pedal to make it parallel and even with the others. The swept area of the disc brakes (10½-inch diameter in front and ten at the rear) is astounding, the 438 square-inch figure putting it right off the end of our bar graph. They are especially large for the SP250's light weight, and they always pulled the car down smoothly and as quickly as road surfaces would allow.

A comfortable ride is difficult to achieve in light, powerful cars with conventional suspension for the suspension and wheels are such a large percentage of the total weight. In order to assure control at the very high speeds which the SP250 can reach, the springs are quite stiff to limit deflection. At lower speeds, the result is a choppy, vintage-like ride, only partially hidden by the comfortable seats. Noticeable vibration finds its way into the steering column and some movement of the dashboard is evident on very rough roads.

Acceleration runs were expected to be the high point of the test procedure with a curb weight to power ratio of less than 15 pounds per horsepower (SAE). We were dismayed to discover that even with the stiff clutch and the Dunlop RS4 Nylon Roadspeeds pumped up to 28 and 30 psi, front and rear, it was impossible to induce wheelspin. The nine-inch clutch just wouldn't bite hard enough, so all we got was clutch slip and a nasty smell. The Daimler Division at Baltimore were gracious enough to install a new clutch over a weekend for us. Even so, we had to start our subsequent acceleration runs carefully.

The excellent times achieved are therefore all the more surprising and the graphical plot on page 51 may be a shock to owners of equipment which competes on the basis of either price or displacement.

The car we tested had been carefully broken in, so we were puzzled to find that the baulk-ring synchronizing was ineffective when shifting from first to second (though coming down from third it was adequate). Gear noise above 5000 rpm in first was supercharger-like in pitch and intensity. The gearbox case looks like the Triumph's, but the ratios inside are much closer together.

Of course, outstanding acceleration is still not the only criterion of a sports car. Our next major area of investigation was handling. We wanted to see whether the vintage-like harshness of the ride could be justified by precision of control.

We would have liked to compare lap times but the wintry conditions prevalent at nearby road circuits prohibited that, so we relied entirely on our smooth, dry test circle. We knew the steering was quick, but the need for only 30° lock for ten mph confirmed and emphasized it.

Higher and higher speeds around the circle took progressively more lock, but never very much, as the Steering Behavior graph shows on page 50. Peak speed was in the neighborhood of 60-plus mph. (We wouldn't put too much stock in the particular figure, as ultimate cornering power is so largely dependent on the individual tires being used). Steering forces required stopped increasing above 45 mph.

Even with a passenger, higher speeds (70 mph) could be indicated by further opening the throttle. The back end would slide out noticeably, but no discernable additional lock was required. However, the extra ten mph should probably be credited to a trace of wheelspin rather than actual speed. With the driver alone, the need for a slip-limiting differential became glaring, even though the test circle is taken as a left hand turn. The speedo then read erratically up to 80 mph. The Daimler had become much more nervous and what had been tiny little twitches of correction became bigger and more frequent as the left rear wheel alternately lifted and lost some traction, then settled and bit again. Suddenly closing the throttle had an abrupt but expected effect, the car diving sharply ino the turn.

Conclusion: if a limited slip differential is made available and if it and the car are recognized as Production in time, the SP250 will be the surprise of the 2.7 liter class in 1960. Whether it will also be the surprise of the $4000 sports car market depends on how many Americans are willing to sacrifice a comfortable ride for stirring acceleration, simple construction and firm control.

(Continued on page 74)

That 1961 Formula AGAINST

from page 27

it is going to be slower. I feel that it is going to be less help to the motor industry because the development of new materials, such as titanium and magnesium, will have very little place in these new machines; one could even go as far as making the crankcase out of cast iron without any penalty whatsoever. Finally, I don't think it is going to be any safer because we shall have to go through a new era of development of chassis and suspensions and the inevitable failures that one gets with anything that is new. There is also a more abstract reason why it will not be so safe: that the driver will have less power to help himself get out of trouble. It is an accepted fact in motor racing that if a driver has reasonable ability, a surplus of power can, on many occasions, help him out of a tight spot. One other point comes up here too. I feel that nowadays when new drivers in the team find themselves a few seconds a lap slower than their Number One team-mates they are content to sit back and try to learn and work up to their maximum. However, I think that when the restriction is dropped down to 1500 cc, instead of being one or two seconds behind their leaders they will be the odd tenth or two behind. This, I am afraid, may encourage them to drive beyond their ability to try to surpass their team-mates and prove that they are better than they really are.

It is true to say that Formula 2 racing of today is quite interesting and reasonably exciting for the public, but I don't think it is ready to take the place of our prime Formula 1.

Many people have asked how this new formula has possibly come about, if the drivers and the team managers and the manufacturers and the owners and, indeed, the sponsors of oil companies and so on are against it. Unfortunately, practically all countries have a vote in F.I.A., or, more correctly, the C.S.I., Commission Sportive Internationale, which decides most of these things. America has a vote, England has a vote and Italy has a vote, but so do other countries such as Switzerland, which has no circuit, no drivers and no cars, and, unfortunately, at the moment no interest in motor racing. These countries are just as powerful when it comes to voting on a subject as important as this as you are in the States, and we are in England. Some of these various countries' delegates, I believe, are laboring under the misapprehension that a smaller formula means a cheaper formula. Somehow they seem to forget that if we have new cars, which are going to be just as specialized as the cars of today, somebody has to pay for the building and development of these machines. If, on the other hand, we continued with the formula as it is at the moment, all that would be needed is small, detail development from year to year, which would keep the cost down to a minimum. Building a second racing car does not cost nearly as much as developing a new one.

I think there are still an awful lot of people around who don't really believe that the new formula is going to come about. All I can say is that the F.I.A. have passed it and ratified it and there is no going back. The only hope we have now of saving motor racing as the enthusiast knows it—the Formula I Grand Prize racing of today—is for the Intercontinental Formula to be made 2.5 liters instead of 3.8 liters. If this could be done I think it would keep Italy happy, certainly England and now it should satisfy America with Lance Reventlow and his Scarabs. If this were done then the organizer would have the opportunity of choosing between the new Formula 1 1½-liter 500 kilogram limit or taking the Intercontinental Formula cars, which would be similar to the Grand Prize car of today. I am pretty sure that if the choice were left to him he would take what must obviously be the most spectacular and interesting to the people who make racing possible—the spectators.—*sm*

That 1961 Formula For

from page 27

on fuel. When it's concluded at the end of 1960, it will have ruled for seven years; no racing formula has ever lived so long! For example when the 750 kilogram formula was introduced in 1934 it was clear from the beginning that it would only be valid for three or four years. In fact it expired at the end of 1937 and was replaced by the 3 liters blown, 4½ liters unblown ruling that lasted only two years—until the war. A variant of this formula (1½ liters blown, 4½ unblown) began in 1947 and, to be sure, was theoretically intended to be effective for seven years—but only theoretically. For in the last two years of the formula, 1952 and 1953, virtually no major races were run to the 1½-4½ rules. Attention had turned to the more active 2-liter Formula 2, which had won the support of both the car builders and the organizers.

This backward glance into history has been necessary to establish that:

1. a new Formula 1 seems to be a pressing need after seven years of the existing formula, and

2. the trend of development seems to be toward reduction in engine size.

When fully developed, the Formula 1 racing cars of 1934 to 1937 had power ranging from 500 to 600 bhp. The displacement of those supercharged engines lay between 5.6 and 6.4 liters, which gives an inkling of the massive torque that was available (see page 66—Ed.) The top drivers of Grand Prize stature — Bernd Rosemeyer for Auto Union; Caracciola, von Brauchitsch and Lang for Mercedes—were able to lap the Nürburgring with these cars in about 9:55. When the 3-liter formula drew near, the experts predicted that with the engine sizes reduced by half we'd never see lap times under ten minutes again. But in 1939 Hermann Lang reached the astonishing time of 9:52 with the three-liter of about 450 bhp. Faster times with less power!

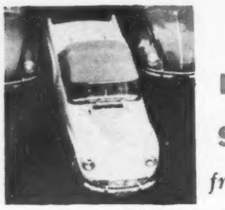
After the war it took a while for the 1½-liter supercharged cars to "grow up". Only a quarter of the displacement of 1937 was available, but even so from 380 to 400 horsepower could be found (Alfa Romeo's Alfetta Type 159). Driven by Fangio and Farina, these "little" cars were also able to reach 9:55 at the Nürburgring, and similar times were recorded by Ascari and Gonzalez with the unblown 4½-liter Ferrari. Three years later 9:55 was also good time for Fangio and Kling with the 2½-liter unblown Mercedes Grand Prize cars. Yet today a 9:55 on the 'Ring doesn't even begin to be competitive for a 1½-liter unsupercharged car! For the lap record for the 2½-liter cars stands at 9:09 (Moss, Vanwall) since 1958, and for the 1½-liter Formula 2 class at 9:37 (McLaren, Cooper). In fact Wolfgang von Trips has already reached 9:29 in a trial run with the Formula 2 Porsche.

In England loud cries of criticism were heard when the new Formula 1 beginning in 1961 was decided (1500 cc without supercharger, which is about the same as our present Formula 2). Having been opposed to this new formula, the English representatives to the C.S.I. had to bow to the will of the majority. At that time the English said: "Races with these little cars will be much too slow to attract the public, and besides they'll be so easy to drive that there'll no longer be any challenge for the top drivers. On the other hand the present Formula 1 is just now getting into full swing."

The latter view was valid only in England, and not in an international sense. The English Formula 1 cars—the Vanwall and B.R.M., the Lotus and Cooper — materialized quite late. Let's not forget that in the first few years of this formula Mercedes and Ferrari, Lancia, Maserati and even Gordini showed up with thoroughly competitive cars, while the British seemed to have no interest in the 2½-liter limit. Only in the fourth year of the formula was an English firm able to win a Grand Prize (in 1957, Moss and Brooks in a Vanwall on home ground). As far as the driving requirements of the "little ones" are concerned, Fangio's 1956 lap record with the 2½-liter Lancia/Ferrari stood at 9:41 on the Nürburgring (which in Germany is the classic standard, because on this course roadholding and brakes count just as much as sheer power and because it's a genuine "driver's circuit"). Just two years later Bruce McLaren turned that 9:37 lap with the 1½-liter Cooper. Granted that the speed of the track has increased slightly in the meantime, doesn't that show a substantial technical advance?

In Nürburgring laps of less than 9:30 the ability of the driver is sufficiently brought to bear, no matter what kind of car is used. At the 'Ring the Formula 1 car of 1961 will already be driven under the 9:25 mark—perhaps under 9:20—and the public will be satisfied, primarily because the field of starters will be better in quality and quantity than ever before. There'll be Ferrari and Cooper, Lotus and Porsche, Borgward and B.R.M., perhaps even Vanwall and Reventlow with his Scarab. I have no concern for the future of automobile racing. The king is dead—Long live the king!

—*RvF*



Daimler SP 250

from page 70

THE V8 ENGINE

The men behind the SP250 are Daimler's managing director Edward Turner and head designer Cyril Simpson. Turner devised the famous Ariel "Square Four" and later the highly successful Triumph Twin motorcycle engines.

It is common for engineers to build one-cylinder engines to investigate combustion chambers and valve gear. What Turner has done is adopt his highly successful 600 cc Triumph Twin as a "prototype", laying out the water-cooled, 90° V8 to incorporate many tried and proven details around the top end.

The bottom end is all-new, previous Daimlers having had six cylinders. It is simple, yet a glance at the one-eighth scale cross-section shows that V8's needn't be all alike. The major difference, an ultra-high camshaft, is the keystone of Turner's design. By placing it so high, it is possible to have hemispherical combustion chambers without the terribly long rocker arms featured in Chrysler's now-abandoned design. The camshaft is so high that the cast aluminum tray under the twin S.U. manifolding actually carries the sixteen hollow tappets, out of sight, of course. The camshaft itself is carried in the block, seven inches above the chain-driven crankshaft. From there out the valve gear is patterned directly after that used in the Triumph Twin. The tappets have curved faces and are prevented from rotating, while the cam lobes have straight flanks.

The cylinder heads are cast of aluminum. They have reverse taper, cast iron valve seat inserts and carry two rocker shafts each. The valves, inclined at 70° to one another, have dual springs. The rockers have an approximately 1.4 to one leverage ratio. The short "Duralumin" pushrods have a coefficient of expansion such that valve clearance (.012 inch cold) varies but little when the engine heats up.

Spark plugs are hidden down long tubes and are within an inch of the cylinder center-line. The leads pass through a plastic bobbin to prevent partial shorting. The aluminum valve cover is held down by plastic rings which thread onto the spark plug tubes, the X-shaped bobbins fitting into the same rings.

With the engine's air-cooled ancestry, so to speak, it seemed reasonable that the only shortcomings we noted were in the water-cooling system. Though the intake manifold is heated by a water jacket just below the S.U. carburetors, the engine takes much longer to warm up than domestic V8's do. One reason would be that there are 7¼ U.S. quarts of oil aboard, which is rather a lot for this size engine by our standards. That water jacket is fed indirectly through short rubber hoses and metal pipes. The heater is fed similarly so there is a multiplicity of hoses and clamps. We had a hose burst under the manifold, which is so high on the engine that the only difficulty it caused was that the heater only heated when the revs were up. We have been informed by the Daimler offices in Baltimore that subsequent production cars have a more strongly reinforced hose material throughout.

The widest dimension on the SP250 is the 24 inches across the valve covers, as the exhaust pipes sweep sharply downward and even inward. An effective remnant of Daimler's reputation for silence is the very large cross-over pipe behind the engine. This eliminates the traditional, uneven "beat" of the V8 from the otherwise separate dual exhaust system.

Very conservatively, the Daimler firm have released only the "net horsepower" figure of 140 bhp at 5800 rpm. A reasonable estimate of "gross" or SAE output is the 155 bhp used in the spec tables and chart. This means one horsepower per cubic inch which is very respectable under any circumstance but especially for a brand-new product with two very small (1¾ inch) carburetors.

It is delightful to see a new sports car reach the market and doubly so when its power plant is a fresh design rather than a warmed-up version out of some sedate sedan. We trust that the same talent which created this engine will soon be able to turn its attention to the chassis' shortcomings. *—sci*

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hind him into third place, Moss retook McLaren, who thereafter hung onto Stirling's tail for the remaining seven laps and was beaten for second place by just one fifth of a second (Brabham won, you'll remember).

Although in fact Bruce was faster during these final seven laps than at any other stage of the race, he says they *felt* at least two seconds per round slower, simply because, with the maestro in his sights, he was no longer hanging his tail so far out in the turns. That 1′ 57.0″ lap of his was his seventy-fifth and last, and exactly equalled the record Moss had set on his 68th. Incidentally, this didn't make McLaren the "joint record holder"; contrary to a common fallacy, except in almost unimaginably improbable circumstances there ain't no such thing as conjoint possession of a record. In this case, Moss, as the first driver to go around in 1′ 57″, was the sole record holder and will remain so until somebody goes not merely as fast but faster.

The consensus being that McLaren's drive in the 1959 British GP was the finest of his career, it's engagingly modest and realistic of him to put the matter in a Moss-towed-me light.

As a driver who has gone a long way in a short time, and still has some distance to go before he can match the First Six's form when he isn't actually inhabiting their slipstreams, McLaren sees driving inspiration as something that comes (if it's coming atall) strictly by precept, rather than just materializing out of thin air. Developing the theme he aired in the British GP context, he says: "As long as I can stay close to fellows like Trintignant, Gendebien and Schell, who I *know* won't put a foot wrong, I'm as happy as a cricket. There's always something to learn in that sort of company. Tailing Moss, Brooks or Brabham is an education, of course—can't get enough of it. But with them I know I'm only in their slipstream for as long as it suits them".

This might appear to be contradicted by the way he latched onto Moss in the breathtaking last act of the British GP, but he's giving you credit for knowing his Cooper had the edge on the Moss BRM in acceleration that time.

If the final criterion of greatness in a grand prix driver is never-say-die spirit, then it's arguable McLaren will never achieve the four-star rating that eludes all but the rare few. Like Mike Hawthorn, he is, on his own admission, a creature of moods on the track. "If my car is below par, or I get to feeling in my bones I won't finish a race, I catch myself thinking, 'Hell, what's all this effort in aid of?' Then it's all up with me".

Outside of fiction, no driver is an idol to another driver, but the one who comes nearest this rating in Bruce's book is, not surprisingly, Jack Brabham. Brabham's vote was largely responsible for McLaren's selection when, in the winter of 1957/8, the New Zealand International Grand Prix

Association debated which New Zealander they should send to Europe. Another candidate, incidentally, was a driver called Phil Kerr. Kerr lost out but he went to England anyway, at his own expense. Today, by an odd turn of fortune's wobbly wheel, he is Brabham's manager at the champion's Surbiton garage business—and shares McLaren's flat. He doesn't race any more. Underlining the penchant these Antipodeans have for hanging together in exile, McLaren's mechanic during '58, before he went on the official Cooper team, was a New Zealander, Colin Beanland; a damn good mechanic too.

Brabham not only fairy-godmothered McLaren into the northern hemisphere, he also fixed him his first drive on a works Cooper (this was an isolated holiday from independence in the Silverstone International Trophy in May of '58, where Bruce placed third in the heavily subscribed F2 division of a primarily F1 contest). Ever since the boy touched down in Britain, Jack has done everything he knows to help and encourage him, including schooling him on which lines to take through corners on a score of circuits. A Brabism that Bruce particularly admires and tries to emulate is his dulcet touch with the shift stick. Transmission, as we saw in our recent sportrait of Jack, was the Cooper stable's Achilles' Heel last year; but the quiet Australian, with a self discipline that enables him to make audibly slower changes than most people even in the hottest fray, will keep a gearbox whole and hale if anybody can.

McLaren, like Brabham, is an engineer as well as a driver, but his knowledge, unlike Jack's, is partly book-larnt and theoretical. Before going to England he was reading for an engineering degree at university in Auckland, his hometown, and the idea was he'd continue his studies in his spare time in Britain. In practice it didn't turn out that way, unless working at Cooper Cars, as he does between meetings, counts as studying. At that, it might be hard to find a better academy than the little equipe that won both of the 1959 grand prix constructors' World Championships, and whose iron was raced exclusively by the season's World Champion driver.

McLaren doesn't work on the actual cars he drives for Cooper, and defines his duties rather vaguely as "hither and yonning between the drawing office and the workshops". In the teeth of certain types of technical problem, he says his academic grounding has its value, to himself certainly and to the Cooper establishment possibly. His father being the proprietor of an Auckland automobile engineering business, in which Bruce toiled honorarily as soon as he was old enough to hold a wrench, it follows that with him practice goes hand in hand with theory.

Except in his driving capacity, he never was actually on the Cooper payroll (as Brabham was until he recently went into business on his own account), so his position in the Cooper Cars setup would appear slightly ambiguous to anyone unfamiliar with the delightful informality of this firm's operations. Assuming he renews his tieup with Cooper in 1960—his plans were still fluid when this was writ-

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ten—he'll likely be doing most of the testing of racing cars that Brabham formerly handled.

Circuits don't have to be short to please McLaren but he surely likes them twisty, not only for the extra fun of driving around them but because, possessed as he is of a faculty for learning intricate itineraries fast, they put him at an advantage. The Nürburgring, over fourteen miles around and as tortuous as anything in Europe, didn't give him any trouble his first time there, as we saw at this story's opening. The mountainous and wiggly Circuit of Charade, scene of the Clermont-Ferrand F2 dice, goes five miles to the lap and usually is reckoned to take a lot of learning, but it didn't bother Bruce when he debbed there last July—a few pre-training rounds in a not very fast passenger car and, first time out in official practice, he was turning lap speeds he wouldn't afterwards improve either in later practice sessions or the race itself.

Once in awhile, though, he admits he can overrate his photographic memory. He did so just once during German GP training in 1958, and by bad luck the resulting goof created an obstruction plumb in the path of S. Moss. When the session finished he spent an embarrassed few hours ducking into doorways whenever he saw Stirling coming. Moss can wag a formidable finger at people who get in his way but his ire has a high coefficient of evaporation.

By McLaren's uncompromising definition, an outright win is Success and anything else is Failure. In these terms, his attack on the 1959 *grandes epreuves* was rewarded only once, an unexpected pleasure since he hadn't been expecting to win any classics. With Jack Brabham plainly headed for the world title from an early stage of the campaign, did he, Bruce, feel he was forced into a position where he couldn't do himself full justice?, we asked. No, indeed. True, Cooper usually saw to it Brabham had "ten horsepower extra and the best gearbox", but these bonuses were his by right of superior prowess and neither Gregory nor McLaren grudged him them. Most times, anyway, a mere 10 bhp was neither here nor there.

For about the first half of the '59 season, up to but not including the memorable British GP, McLaren had been taking it relatively easily and concentrating on making the machinery stay in one piece. Post-Aintree, he was really having a go—"and then things started breaking". At Avus in the new style German GP he blew his clutch in the second heat (after finishing fourth in the first), so was unplaced overall. At Lisbon in the Portuguese GP he lay third to Moss and Gregory at mid-distance, subsequently going out with a broken gearbox. Finally, at Monza (Italian GP) he had a piston collapse, resulting in the normally reliable Climax engine being practically cut in half. One of the few ills to which the Climax is prone is the breakage of cam followers—this caused his retirement in the sub-classic Kentish Hundred at Brands Hatch last summer; but they only break if the valve springs have too much mileage on them, allowing bounce to set in.

The Avus, with its utterly unroadlike North Curve banking, bottom-gear South Curve and otherwise unrelieved and dead straight autobahn, which wrung fervent never-again vows from the generality of drivers, surprisingly appealed to the Aucklander. One thing it needed aplenty was guts. Nobody who's seen him race denies McLaren credit for guts and his performance in the 1959 German GP should ensure nobody ever does. "I wasn't quite game enough to stay with the lead group", he told us, "so I got into the second. It was a lot of fun seeing who could get into the Ferraris' slipstream—me or Harry Schell or Masten Gregory. With predictable blokes like Harry and Masten you could really argue it out at close quarters without anything to worry about".

Of course, if you were the worrying kind it might occur to you to wonder what would happen if, for instance, any vital chassis part broke up on the car you were closely tailing onto the towering North Curve at 130 per hour. Evidence of the "artificial weight" effect operating on this turn is discernible in photos showing the cars' front wheels both canted simultaneously to an angle indicating almost full spring deflection. Traditionally, Avus type racing is an American specialty, and Masten Gregory, the Cooper team's U.S. member, upheld his country's reputation by sticking his head out further than his Australian and New Zealand colleagues in attempts to offset the Ferraris' superiority in flatout speed (Brooks, for Ferrari, won the faster heat at over 146 mph, you'll remember). But McLaren, who didn't have enough steam to head the Ferrari boys even momentarily, and therefore got no relief from the perilous slipstreamer's role, left eyewitnesses in no doubt *he* has a telescopic neck too.

His major scare of 1959, as it developed, was a vicarious one—in behalf of Jack Brabham at Lisbon, when he, Bruce, came on the scene of the big Brabham/Cabral drama and saw a cloud of dust settling on Jack's wrecked and driverless car.

Backtracking to the first 1959 Championship qualifier, Monaco GP, we come up with fresh evidence in support of McLaren's claim that during the first half of the season his main concern was keeping his car in one piece to ensure finishing his races. In this one, however, he perforcedly settled for *not* keeping it in one piece but finishing nonetheless. His Monaco placement, in case you've forgotten, was fifth, which, as there were no other finishers, was synonymous with last. But there was more merit in this performance than meets the eye, because for one thing his was the only works Cooper of sub-F1 displacement (2.2 liters to be exact); for another thing, although the fact didn't emerge from the contemporary reports, in this 100-lap race he was smacked in the tail by Harry Schell's BRM on the seventh lap and drove the rest with a broken rear wishbone. The four who finished ahead of him (Brabham, Brooks, Trintignant, Phil Hill —Cooper, Ferrari, Cooper, Ferrari respectively) all had fullhouse 2½ liter engines, and Bruce's semi-crippled Cooper was only a lap behind the Hill Ferrari at the end.

(Talking of wishbones sends us sidetracking into parenthesis and onto the teched's preserve to elucidate a point concerning the Cooper backend layout. The 1959 single seaters rang changes—varied according to the circuit—between single and double wishbones. It's a prevalent fallacy that the latter were "better" than the former. Actually it was partly a matter of individual taste and partly, as implied above, a question of track characteristics. With single links the roll center comes about one inch above road level, with double links it's between 3 and 4 inches off the ground. The double system is, as you'd expect, the more roll resistant, and the breakaway, when it starts, happens faster).

Apropos, the only time during 1959 that McLaren beat Brabham fair and square was at Teretonga, New Zealand, in February, when the score was Mac-Brabham-Flockhart, the latter driving a BRM for the Owen stable. The connection with our wishbone lecturette is that Bruce's Cooper was using the single link tackle and Jack's the dual link. Personally we'd never have known this gave junior an advantage (Teretonga abounds in tight turns) if he hadn't made a point of mentioning it.

Reverting to the 1959 Championship series, the circumstances of McLaren's Rheims ride in the broiling Grand Prix d'Europe set a pattern that was to be repeated with elements of curious similarity in Britain's *grande epreuve* at Aintree. At Rheims, after an electrifying last lap battle, Bruce was beaten for fourth place by one fifth of a second, losing to Olivier Gendebien (Ferrari). Two weeks later, at Aintree, as we recalled before this story degenerated into chronological chaos, Bruce lost another frenetic last-lap duel by one solitary fifth, ceding second place to Moss and the British Racing Partnership's BRM.

Rheims, a tailormade Ferrari circuit, typifies the sort of geography McLaren dislikes most; though it would have been hard to name anybody, the successful Ferrari team included, who exactly enjoyed the ordeal by roasting they endured in the unprecedented temperatures that smote the Champagne countryside on July 5, 1959. This incidentally was Bruce's first drive with a full 2½ liter Climax at his back. For him, he recalls, it was a simple two-way choice between slipstreaming one or other of the Ferraris (involving shrapneled facefulls of flying stones and almost unbearable heat, in there out of the draft), or voluntarily going off "tow" and at least enjoying a spell of air cooling and temporary respite from the hail of flying granite.

If the 1959 British summer had been average, weatherwise, instead of the dryest in living memory, McLaren would likely have won more races than he did win, for he's good on a wet surface. To bring out the brilliant best in him, it takes a combination of a short, snaky circuit *and* wet conditions, as he demonstrated in April of last year in the rained-upon Martini Trophy meeting at Brands Hatch, England, where the lap distance is less than 1¼ miles; driving a private entrant's 2-liter sports Cooper Monaco, he won the only race he contested at the highest speed re-

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turned in an 11-event program. A couple of weeks later, again in the wet, he placed second to Maurice Trintignant in the F2 Pau GP in south-west France. The Pau course, only 1.7 miles around, is one of the few surviving street-corners circuits. This Pau dice, incidentally, underscored the mercurial facet of McLaren's temperament: in the early stages he was catching up on Trint at the rate of 5 seconds per lap, then he spun out without hurt or or damage and thereafter was lapping 6 seconds per lap slower. If there were any lipreaders on the sidelines they probably caught the words "Hell, what's all this effort in aid off?".

That Brands Hatch caper on the Cooper Monaco was Bruce's only effective drive on sports cars during '59. He'd had an ambition to compete at Le Mans and, as co-driver to Jim Russell (Cooper), he got his wish to the extent of about a two-hour stint. Then Russell crashed the car and it burnt out. In the TT at Goodwood, McLaren was partnered with Brabham but Jack blew up before junior's turn to take over came around.

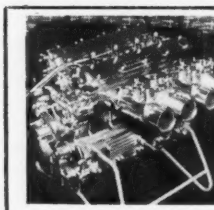
Within the limitations of the Morris Minor 1000 he's been using for personal transportation in England, Bruce enjoys his street driving and covers ground with a rapidity belying 58 cubic inches. Weeks before Jaguar launched their new 3.8 liter Mk. 11 sedan, he'd ordered one, complete to triple carb 'S' spec, and it has now been shipped to Auckland for joint use in N.Z. competition by Leslie McLaren and Bruce Leslie McLaren, father and son. By the time this story appears the latter will likely have had an opportunity for chronometrically testing his theory the 3.8 will outaccelerate anything on wheels in N.Z. Four wheels anyway.

"In deep and awful channel runs, the sympathy 'twixt sires and sons", and the two generations of racing McLarens could be cited to prove Tennyson right. Mac senior, who is president of the New Zealand Racing Drivers' Club, gave his kid a foretaste of the joys of motorsport before he was old enough to hold a driver's licence. As a schoolboy in his low teens, Bruce was navigating and timekeeping for his father in North Island trials and rallies on a Ford V8 sedan, and between them they won their country's reliability trials championship. As soon as Bruce reached licenceable age (16), the deep and awful channel yielded a hopped up Ulster Austin Seven, and on this one he served an instructive apprenticeship in varied competition—driving tests, gymkhanas, hillclimbs. Sometimes sire would drive against son in the same meet, each taking it in turn to cram his tail into the Ulster's exiguous bucket seat.

Later a made-over 1172 Ford replaced the Austin, and later again, in '55, the two-man Scuderia McLaren treated itself to the first Austin-Healey 100 to be imported into New Zealand. Restrictions on modifying sports cars being lenient in N.Z., the McLarens had their Healey compressioned sky high and running on alcohol. In an attempt on the national class D kilometer record it clocked a respectable 132 mph. The fact that it didn't succumb to stresses undreamed of in Warwick and Longbridge philosophy may be ascribable to the Maori tikki—sort of a lucky charm—that Bruce always carried on his person and still does.

In March of 1957, when he was nineteen and some, McLaren bought his stepping stone to big time racing, viz., a sports Cooper with a $1\frac{1}{2}$-liter single cam Climax engine. He'd planned to go steady with this one (which Jack Brabham had sold him); but Temptation, again in the person of Brabham, loomed up once more, dangling two full race Coopers before the boy's impressionable eyes—1700 and 2-liter Climax jobs. On the seventeen-hundred, Bruce contested his country's international race series and placed second to the experienced and regionally famed Ross Jensen (250F Maserati) in the New Zealand drivers' championship.

With this success behind him, and Brabham's vote of confidence as makeweight, there couldn't really be much doubt which way the verdict should go when the New Zealand International Grand Prix Association debated the who-shall-we-send-to-Europe issue. McLaren it was, and if they've ever regretted their decision they must be remarkably hard to please. *—dm*



Triumphant Climax

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inches in the $1\frac{1}{2}$-liter version. Although the exhaust valve head diameters have also been increased with the growth of the engine, the port, which is of rectangular form at the joint face, has remained unchanged. Experience has shown that it's of the right proportion in the larger engine, but was too large for the $1\frac{1}{2}$-liter, and extra power could undoubtedly be obtained by increasing the exhaust velocity in this latter unit.

Some qualification is perhaps necessary in the power outputs. For example, the maximum power achieved on the latest $2\frac{1}{2}$-liter engine is 239 bhp at 6750 rpm. In comparison with the claims of B.R.M. with 280 bhp and Ferrari with 290 bhp, this may not seem very good. The figures given by Climax are sustained readings on the test bed, while many others are suspected of being a flash reading recorded by a swing of the needle. Peak powers, however, are not the be-all and end-all of winning motor races. Fat torque over a wide range is equally important, and in the case of the Climax units seems to be particularly good judging from race results.

The main features of the engine can be observed from the cutaway drawing and cross-section reproduced. From these it will be seen that the valves are operated directly with inverted tappets, the clearance being adjusted with an individually ground cap on the top of each stem. The tappet blocks are separate components cast in magnesium alloy with a bolted-in cast-iron

guide for each tappet. Ten studs, providing in effect four studs per cylinder, secure the head to the crankcase. In addition there are four studs on the water gallery side, nutted from below to avoid the possibility of a water leak on this side where the joint face is rather wide. The ten main studs are anchored low down in the crankcase to avoid local distortion at the joint face, and at the same time provide a high degree of elasticity.

During the growth of the engine the cylinder centers have remained unchanged at 4.175 inches. With the increases in bore size this has meant that the top land forming the fire joint has been successively decreased, as also have the water spaces around the liners. The stages of bore size enlargement have been from 3.0 inches for the V8, 3.20 inches for the 1475 cc, 3.40 inches for the 1960 cc, 3.50 inches for the 2203 cc, and 3.70 inches for the 2495 cc. Strokes to match these have been 2.675 inches, 2.80 inches, 3.30 inches and 3.50 inches for the last two, respectively.

To overcome the problem of a fire joint with the narrowest land of the 3.70-inch bore there is a laminated metal fire ring on top of each liner, with a narrow shoulder holding it in place, as shown in the cross-section drawing. The reduced water spaces round the liners are probably an advantage because the smaller areas result in a higher "scrubbing action" to pass the same volume of water.

One of the changes made in this year's $2\frac{1}{2}$-liter engine is a lower positioning of the gear-driven water pump. In the V8 engine this was driven from one of the idling spur gears in the cylinder head and this was retained in the transition to a four-cylinder unit. This position presented certain installation problems, arising from its relatively high position in the four-cylinder units, and it is now driven from one of the intermediate gears in the crankcase train. Each cylinder is surrounded by a circular water jacket fed by bleed holes from the main gallery on the exhaust side of the crankcase. The main coolant flow is vertically upwards through the head, across the exhaust seats, valve guides and spark plugs to the take-off on the inside of the head on the induction side.

There are five main bearings with split caps and it is in this region of the engine that the main changes have taken place with the successive enlargements, although the nominal sizes of the bearings have remained unchanged. As in the V8 all the mains are 2.5 inches in diameter and one inch wide, being of metal-backed lead-bronze type. The big-ends are 2.125 inches by 0.875 inch—0.125 inch wider than in the V8 unit.

In the original $1\frac{1}{2}$-liter design the main bearing caps were orthodox aluminum castings and the crankshaft had balance weights equivalent to approximately 70 per cent of the reciprocating mass on the two webs adjacent to the center main and on the two outermost ones. As the bores and strokes were progressively increased these integral balance weights were insufficient, causing the loads on the center main bearing to become excessive. In fact this became the Achilles heel of the engine, and if the rpm limitations were not observed it was possible to punch the complete center main bearing panel out of the casting. The solution took two forms. Steel main bearing caps were used and each was braced into the crankcase casting by two 5/16-inch diameter transverse studs. At the same time, arc-shaped weights of G.E.C. heavy metal — a Wolfram alloy having the density of lead and strength of mild steel—were recessed in and bolted to the existing balance weights to increase their mass.

The big-end journals are counterbored with large diameter holes from each side to reduce the rotating mass and also to form effective sludge traps. There are oil-way drillings between consecutive crank-pins which provide an end-to-end feed through the crank, minimizing the possibility of oil failure. To aid the bottom-end stiffness the crankcase is of barrel form and heavily ribbed externally. In the original $1\frac{1}{2}$-liter version there was a web in the form of a catena arch between each main bearing panel to increase vertical stiffness, but as the stroke was successively increased this had to disappear, and as far as one can judge it had little effect on distortion.

The unusual arrangement of the oil pumps serves a twofold purpose. Three pumps of equal capacity are placed low down in the shallow sump so that they're always flooded to minimize aeration. As the engine is designed to operate on the dry-sump principle there's a separate scavenge pump for the front and rear portions of the sump to collect oil effectively

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Triumphant Climax

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under braking and accelerating conditions. Between them is the single pressure pump, the three being mounted in line immediately below the main bearings. They're driven from the auxiliary timing gears by quill-splined driving sleeves. The layout has the advantage of adding to crankcase rigidity, for each of the pump bodies is mounted in a saddle housing straddling a main bearing. All oilways are drilled passages.

Brief examination of the cutaway drawing may give the impression that the oil pumps are driven at a speed considerably faster than the crankshaft. They actually operate at 0.57 times crankshaft speed, the large gear on the crankshaft being an idler on the outside of the main gear which is driven from the first stage in the gear train.

Cast-aluminum pistons have been used throughout the development. On the original V8 and $1\frac{1}{2}$-liter two pressure-backed Dykes compression rings, chrome-plated on their working surfaces, were used in conjunction with an oil control ring, all placed above the wrist pin. The latest arrangement is to use a Dykes ring in the top land and a plain compression ring in the second one.

Naturally a considerable range of compression ratios has been tried with the various combinations of cylinder capacity and fuels. They range from 10.0 to 1 with the original $1\frac{1}{2}$-liter to 12.4 to 1 for the two-liter; the current $2\frac{1}{2}$-liter operates at 11.9 to 1. Higher compression ratios have been used experimentally with alcohol fuels, but these engines have only been used for special Free Formula races.

Many people thought that when the use of alcohol mixtures was banned in favor of hydrocarbon fuels engine performance would suffer, but, in fact, aviation gas with a P.N. of 100-130 seems to have little effect in limiting output. In the Climax range the only basic change which had to be made to suit this fuel was the use of nimonic 80 steels for the valves. These fuels have also permitted a saving in weight on the cars, which has been reflected in increasing average speeds on every circuit as a result of a smaller change in handling characteristics between full and empty tanks. It is not surprising, therefore, that in addition to giving very good power, the Climax engines also record fuel consumptions at least equal to many production cars. On the latest $2\frac{1}{2}$-liter the best specific fuel consumption is 0.49 pt/bhp/hr at 5000 rpm, increasing to 0.61 at maximum power.

In the early stages of development and racing of this range of engines, twin-throat S.U. carburetors were used for all the sub-$2\frac{1}{2}$-liter sizes, and at certain points in the rpm range they delivered more power than the more popular Webers. Initially there was some difficulty in getting the S.U.'s to pick up cleanly when the throttle was banged open coming out of a corner, but this deficiency was overcome. Since the only available bore is $1\frac{3}{4}$ inches, the S.U.'s couldn't be used for the larger $2\frac{1}{2}$-liter engine.

In any engine with a wide operating speed range, particularly when large valves, ports and carburetors are used in conjunction with wide valve timings, the main problem is to avoid 'hollow backs' in the torque curve. These can be moved around and reduced to a certain extent by tuning on the intake and exhaust sides, but there are limits.

It is in this sphere that fuel injection has definite advantages when compared with carburetors, although the merits of each are equal in terms of maximum power. The advantages obtained from fuel injection were seen when comparing the performance of a $1\frac{1}{2}$-liter Cooper-Borgward with a Climax-engined counterpart. The Borgward could pull away noticeably on corners, although it had no edge in maximum speed. The next stage in the development of these Climax engines will undoubtedly be directed toward the use of fuel injection.

It would appear that this range of four-cylinder engines is reaching the peak of development, but there is still more work to be done on the $1\frac{1}{2}$-liter version, which has been somewhat neglected because of pressure of work on the present Formula I unit. Furthermore, the lessons learned on the four-cylinder unit could be applied directly to the original V8 without much weight penalty. In its original form, ready for installation, this unit weighed 340 pounds. The $1\frac{1}{2}$-liter turned the scales at 255 pounds, which has grown to 290 pounds for the $2\frac{1}{2}$-liter version which, incidentally, is almost exactly the same as the B.R.M. four-cylinder unit's weight.

It seems certain that whatever line of development is taken between the four-cylinder and V8 for the 1960 season, British constructors have a very sound and reliable power unit to ward off the challenge from Continental rivals. The credit for these achievements must be accorded to Mr. Leonard Lee, chairman and managing director of Coventry Climax, and his sound chief engineer, Walter Hassan, whose fame in the racing business was firmly established 30 years ago. *—hm*

Turbine Racing Cars

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would leave no eyes for the road. The usual answer is to provide a system of governors that sense compressor discharge pressure and rpm — these are then calibrated to prevent any overheating or overspeeding under any likely operating conditions, both during acceleration and steady running. The driver merely resets the governor limits.

ADVANTAGES AND DISADVANTAGES

We've already discussed the beautiful power curve of a g.t. engine. This is a vital advantage in almost any kind of racing. There have been many instances where five or ten horsepower at some point in the speed range have meant the difference between first and second place. But don't take my word for it.

Leonard Williams, an engineer at the Boeing Airplane Co., did a very clever SAE paper a couple of years ago comparing the performance of the Boeing Model 502 g.t. engine with a 270-cubic inch Offenhauser in a typical Indianapolis race car. Some of his calculated performance graphs are shown here. He assumes 330 bhp for the Offy and 300 bhp for the Boeing g.t., and a weight advantage of 325 pounds for the g.t. car. Note the advantage in torque of the g.t. coming out of the turns, which more than compensates for the difference of 30 bhp at the end of the straightaway. When everything is considered Williams figures the g.t. car would gain .25 second and 65 feet of distance on the Offy-powered car on each main straight—or about .6 seconds per lap! He sounds very convincing. (Of course the latest Offy engines are pulling in the 375-400 bhp range, but we presumably have more powerful turbines now, too. Also, any racing man will tell you that acceleration off the turns is more important to lap speed than 3 or 4 mph peak speed on the straight.)

This theoretical power curve advantage of the g.t. engine over a piston type is further substantiated by experience with the previously-mentioned SAC project car with the Boeing engine. This was an early Model 502 engine, developing about 195 bhp, mounted in a Kurtis 3000 car that ran in the 1952 Indianapolis race. (The car had been bought by Firestone for tire experiments, and loaned for the SAC project.) It weighed a little over 1500 pounds dry with the turbine installed. At the 1955 NHRA national championship drags at Great Bend, Kansas, the combo turned a quarter-mile e.t. of 13.4 seconds and a terminal speed of 107 mph at the finish line. Now this would be just about what a hot rod or sports car of similar weight/power ratio would turn . . . but only with a three or four-speed transmission. The g.t. used only one gear forward, coming off the line like a shot by revving the engine up with the brakes locked—and there was hardly a whisper of wheelspin. It was a beautiful demonstration of the potential of the g.t. competition car. And I believe it proved quite convincingly that the unique power curve of a g.t. engine is worth two or three gear changes against a piston-type engine of the same maximum bhp. The traction benefit of the static torque feature, where you don't have to engage a hairy friction clutch and feather off the line, was also demonstrated. It's just like taking off with a fluid-drive transmission.

The other vital advantage of a g.t. engine, as far as racing is concerned, is small size and weight in relation to power produced. The "SACFireboid" weighed about 300 pounds less with the Boeing g.t. than with the original Offy powerplant. Not only is the engine itself lighter, but you save the weight of radiator and cooling system, and the gearbox can be made smaller and lighter (you would need only a reverse box in many applications.) And we've barely scratched the surface in "hopping up" the basic g.t. engine principle. The Boeing 502 was essentially a commercial design, built for long life, economy and economical production. Special racing g.t.'s, with high compression ratios, high turbine temperatures — but

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Turbine Racing Cars

from page 81

probably not bulky regenerators—could be built to weigh well under a third of a pound per horsepower! This could lead to complete race cars weighing around two pounds per horsepower.

How about disadvantages? Plenty of them, I fear. The big one, as you've probably surmised, is cost. Not only are the necessary high-temperature materials costly — some of them running over $3.00 per pound — but fabricating techniques with these materials are complex, time-consuming and very expensive. You don't stamp out high-performance g.t. engines like popcorn. The only two U.S. engines in the 300-bhp range that are commercially available, the Boeing 502 and Allison 250, cost in the $10,000-$15,000 range. These are only being produced in experimental quantities now, and volume production would undoubtedly bring the cost down, but 300-horse, 100-pound g.t. engines at prices less than $1,000 just aren't in the cards now.

Further, this isn't the kind of engine you build in a basement workshop. The present state of the art is crude, so a tremendous amount of skilled engineering is required to lay out a design that will run for even 10 minutes without blowing up. Even a capable specialty builder like Ferrari might be hard put to turn out a competitive g.t. engine. I look for the first out-and-out racing g.t. engine to come from a big outfit like Mercedes-Benz. However it is entirely possible that a U.S. commercial producer like Boeing or Allison might loan an engine to some capable private party or racing organization for serious experimental purposes. Much could be learned, but it would be expensive. In fact, we have heard just the whisper of a rumor about an Allison being used in this way . . .

Then there are operational disadvantages with a g.t. engine. Chief among these is the problem of engine acceleration. The compressor and turbine here have a considerable amount of rotating inertia, or flywheel effect, and the assembly won't jump up through its full speed range in a second when you "wing" the throttle like a piston engine will. And since the compressor has to be up to full rpm before the power turbine can put out much torque, the effect multiplies itself to mar the throttle response and acceleration of the car. The Boeing 502 requires a full three seconds to accelerate itself from idle to full speed with open throttle. One way to solve this that has been tried successfully is to put some form of waste gate between the compressor turbine and power turbine. The hot combustion gas can be dumped overboard when you get off the throttle—allowing the compressor to continue at full speed. Then you have instant torque available by just closing the waste gate. Hard on fuel consumption, but a possibility for racing.

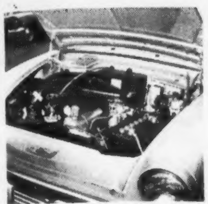
Speaking of fuel consumption brings up another serious disadvantage of the g.t. engine for long-distance races. It's a fair glutton for fuel. Specific consumption of a high-efficiency racing design without regenerator would probably run between .70 and 1.0 pound per hour. This means that a 300-bhp engine, working hard on a tight 80-mph course, might show about two miles per gallon with the waste gate feature for acceleration. For a 100-mile race this would increase the fuel load perhaps 230 pounds over an equivalent 300-bhp car with an alcohol-burning piston engine (5 mpg). Efficient exhaust regeneration could double the mileage of the g.t. car, but weight and bulk would be problems. (Regenerators designed up to now have been pretty big.) The waste gate wastes fuel, but seems necessary because of the acceleration problem. Right now I fear fuel consumption will remain a big problem on near-future g.t. race cars, except for short sprint races.

Another bug is the lack of any appreciable overrun braking with a g.t. engine. The power turbine just windmills when you close the throttle, so there is very little extra drag on the car. This means extra loading on the brakes, as compared with a piston-engined car that can be downshifted and which utilizes engine inertia for braking. It could be a killing disadvantage on tight courses like Sebring. Several solutions have been tried. Perhaps the best is the method used in the Boeing-Kenworth turbo truck experiments in 1950. They put a planetary gear in the drive line that would cause the drive wheels to rotate the power turbine *in reverse*, against the normal gas flow. This gave a high drag torque on the power turbine, and the energy absorbed was beautifully dissipated to the atmosphere through the exhaust. Furthermore the braking effect could be increased by merely feeding more fuel. The drag horsepower at full throttle and rpm was 400—or over twice the normal output of the engine! Another trick is to put a clutch between the compressor and power turbines, so the rear wheels can be made to drive the compressor on the overrun; when the fuel is cut off this gives a good braking effect—though not as much as the reverse-turbine system. Anyway, I don't think we need be concerned with this problem at all.

Other problems? None of them too important. Obvious problems like reliability, cockpit ventilation, exhausting huge quantities of hot gas, etc. can be solved by research and development. They're small compared to the basic bugs like high cost and fuel consumption. Even classification would be a problem in racing. Some discussions have suggested limiting the area of the air inlet orifice. This would force development of compressors, turbine temperature characteristics, regenerators—and sounds like a good idea from here. A fuel consumption limit might make things interesting. All these problems will require a lot of thought and time.

But the gas turbine type of powerplant *would* be a wonderful bet for auto racing. It would be good for performance, good for the spectators, good for the enthusiasts—and the technical development *could* start a revolution in the whole field of road transportation.

—rh



Hillman Easidrive

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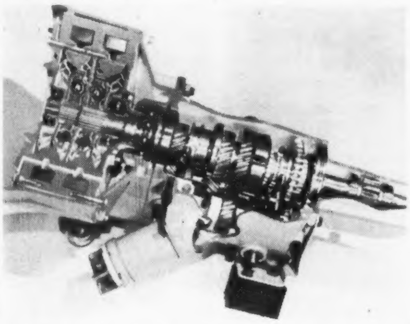
proposition, about $1\frac{1}{2}$ seconds being required for the engine speed to be pulled down and the second gear selected, but some forward momentum is retained by the momentary engagement of the top gear clutch. When the shift is accomplished there's a mild "clunk," more noticeable at moderate throttle openings but never so obtrusive as the action of Chrysler's old hydraulically-shifted M-6 transmission.

Once second has been engaged the drive is perfectly solid once again until time comes for top to be selected; this can be anywhere from about 22 to 50 mph, depending on the accelerator position again. This time there's just a brief hesitation as the clutches "pass the baton" and go into direct high gear.

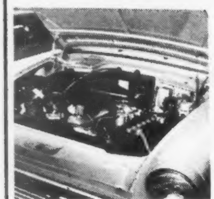


On a closed throttle, downshifts into second and first will take place at speeds of 16 and 6 mph respectively. On full throttle, demanding acceleration, Easidrive will "kickdown" to these ratios at road speeds of up to about 38 and 15 mph. All downshifts take place very quickly indeed.

A "2" position on the control quadrant will hold the Easidrive in second gear indefinitely, and is thus useful in making downshifts to second for braking. More out of sheer necessity than anything else, this transmission shows unusual intelligence in making this downward change. To bring the cogs to the right speeds to allow second gear to be engaged, the engine has to be speeded up, which is more than the average car driver realizes. Easidrive does it with a special "blip" solenoid which briefly jogs the throttle for that purpose, then closes it instantly to provide braking. This feature alone makes this one of the "smartest" automatics SCI has ever encountered.

In driving the Hillman in urban traffic one soon discovers that there's an awkward point around 25-30 mph where Easidrive can't make up its mind between second and high. In these conditions it simplifies matters to select "2" and leave it there until you either emerge into the open or come to a halt. The Hillman *will* start up again in second, with excessive slip in the clutch and a writhing movement which indicates its built-in desire to shift from first to second, but the practice is *not* recommended as it shortens the service life of the powder (which is likely to be as

(Continued on page 84)



Hillman Easidrive

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much as 60,000 miles or, as Smiths say a bit pessimistically, it "will outlive the engine"). If you happen to select "2" by mistake or deliberately at rest, Easidrive will start out in low and then shift to second as usual.

By now it will be obvious that this is a very sophisticated apparatus that offers the skilled driver many interesting and useful tools while eliminating all of the drudgery. It does this with a simple basic machine allied with an electrical control system that is frankly complicated. Its main elements, found under the hood, are a gearbox-driven governor and a "control unit" which interprets the various signals reaching it from the governor and selector lever. These are the elements most fragile and thus most susceptible to failure, a chance that is minimized by the experience applied by the aircraft equipment branch of the Smiths company. When necessary, any servicing of the governor, control unit or similar basic components will be done by an exchange of sealed assemblies. Any tampering with the seals by the car owner will void the guarantee—a protection against altering of the shift speed settings, among other things.

The way Easidrive is controlled is the feature that sets it apart from most automatics, which depend on hydraulic torque converters. The torque multiplication and slippage that take place within a converter depend on the velocity and direction of the fluid that's also transmitting the power. No such fleeting factors govern the Smiths transmission. The ratio in use and the slippage allowed are determined *externally*, within tolerances no sloppier than the loosest joint in the throttle linkage. The result is a gearbox that is just as efficient as a manual unit in over-the-road use, causing no mentionable drop in mileage or loss in performance under those conditions. Around town, the Easidrive's eagerness to select a lower gear does appear to increase fuel consumption by about 10 percent—a modest price for such convenience, on a car of a displacement thought impossibly small for an automatic transmission a handful of years ago.

Much of SCI's test of the Easidrive Hillman was carried out in stop-and-go town driving, often in the evening with lights on and the heater blower working in wintry weather. Under these circumstances it was more disappointing than surprising that the Hillman had to be started with its very convenient crank on the last morning of the test. It's difficult to say whether, as Rootes technicians suggest, the heavy current drain under these driving conditions could be counterbalanced by a change in voltage regulator setting. Hillman wouldn't be the first overseas manufacturer to find that its standard generator was outpaced by the American penchant for extensive use of accessories—now aggravated by an electrically-operated transmission. Perhaps the alternator will offer a solution.

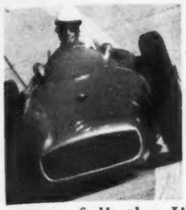
Usually the Hillman's willing engine started promptly, the hand choke being needed only briefly until the car gets under way. Compared to earlier Hillmans power and torque have both been increased by changes in manifolding and carburetion, and the resulting performance is well up to the demands of U. S. traffic. The same applies to the car's cruising speed, which is comfortably in the 60 to 65 mph range. Faster speeds can be maintained but at the expense of a "busy" feel and sound. Brakes have also been improved by an increase in size for 1960, and are entirely up to the performance of the car. An especially good Rootes feature is the pull-up handbrake placed at the left of the bench-type front seat where it's out of the way yet can be firmly applied.

Easidrive makes this Hillman ideal for around-town driving, but unfortunately the handling moves slightly in the opposite direction. With 58 percent of the weight on the front wheels the car understeers strongly to start with, and to boot its steering, though quick, is surprisingly heavy in action for a car of this size. Nor is the turning circle very small. These are built-in disadvantages that may be ameliorated but not eliminated by adjustments in tire pressures.

As usual in a Rootes product the standard of interior design and trim is unusually high. All dials and controls are concentrated on a centrally-placed dash panel, which carries a near-accurate speedometer closest to the driver. Spreading below the dash is a deep package shelf which is extremely handy, especially for odd change for tolls. New this year is a more lavish seat cushioning which is comfortable enough in itself, but its fore-and-aft adjustment range leaves a great deal to be desired. For anyone of any height at all it is impossible to sit comfortably in the seat of this car. If the seat were allowed to move three more inches to the rear (dealers are equipped to modify the tracks somewhat) it would make all the difference in the world. Of course rear seat leg room would be more limited under these circumstances, but the thoughtful driver can always slide his seat forward a bit when he's carrying more than two people. Never poor, the forward view has been improved by increasing the windshield area and slimming down the corner posts.

With a wide and spacious rear seat, ample head room and a roomy trunk encased in styling that's contemporary conventional, the new Hillman is a highly practical family automobile. It bears mom and the kids over the road with a ride that's generally good but can be prone to choppiness on bumps of the wrong frequency. The car SCI tested boasted De Luxe trim, for which the basic price is $1875 at a coastal port of entry. For pricing, Rootes will be looking to the Hillman Special, with more modest detailing which brings its base price to $1735. The Easidrive automatic will sell for $199 extra (considerably less than the surcharge in England, by the way), which, along with a $60 heater, will allow an automatic-equipped Hillman to go on the market for $1994—just under the magic $2000 figure. This promises to be a very attractive proposition indeed.

—*sci*



Paragons Revisited

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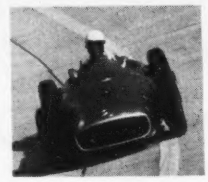
quarter full the W125 has a power-to-weight ratio of 3.1 pounds per horsepower and the massive power plant marches up the scale like no other Grand Prize engine ever built. At 1500 rpm it produces 170 horsepower, at 2000 rpm 248, at 3000 rpm 406, and 525 at a mere 4000 rpm. Peak power of 646 hp is reached at 5800 rpm. Or, roughly, the same urge encapsuled in 17 Volkswagens. Naturally, the straight between the banked and hairpin turns is much too short to unleash this sort of power. In any case I stayed in third gear as I approached my predetermined cutoff point. I braked hard for the cobblestone paved hairpin and received a shock.

I'd say that the rate of deceleration roughly corresponded to that required by law, but no more. I could see the look on Uhlenhaut's face if I had to go back and tell him that I had bent a classic and irreplaceable car. With this in mind, I hustled back into second and then down into first. While all this was going on we arrived at the entrance to the curve. I found, much to my surprise, that I was able to get through the corner. Not with any degree of elegance—the tail seemed to have a mind of its own—but at least we came out the other side all in one piece, and roughly pointed in the right direction.

The reason for my difficulty was not hard to understand. When the W125 was built, heat-resistant brake linings were unknown, and those that were used had to be as hard as possible to give them enough life for racing use. Such hard linings—used without servo in the W125—require colossally high pedal pressures. Like all pre-war racing cars, this W125 used all of a driver's physical strength.

The next car—in chronological order—was the three-liter V12 W163. This successor to the W125 had 25 percent less horsepower—480—but an ability to turn much better lap times. Better roadholding, more driver comfort, and slightly better brakes are all responsible for the improved lap speeds of the W163. This 1939 GP car represents the beginning of the modern school of racing engine design at Daimler-Benz. *(Continued on page 86)*



Paragons Revisited

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The V12 engine with four overhead camshafts and two-stage blowers delivers maximum power at 7800 rpm. The drive to the two compressors alone devours 150 bhp or 32 percent of the engine output, and the valve timing overlaps are so large that little power is available below 4500 rpm. Compared to the 5.6-liter monster the W163 feels like a civilized and cultivated car. In spite of being more sensitive than the "fat one" it is easier and more agreeable to drive.

From the five-speed box, which like all racing car transmissions of its time wasn't synchronized, I needed only the lower four on the test track. It proved necessary to take the hairpin in first gear. At a speed higher than 35 or 45 (racing cars have no speedometer) the stiffly-sprung car can't be held on the cobblestone surface, and with the Nürburgring gear ratios 45 in second gear corresponds to only 3200 rpm —at which speed the engine only spits and oils its plugs. The acceleration of the 3-liter car is substantially inferior to that of the 5.6-liter. When you accelerate full out in second gear there isn't this overwhelming force like the steam catapult of a carrier plane, but it completely satisfied my humble tastes. Moreover, second gear suffices (according to the ratio table) to 102, third to 130, fourth to 150 and fifth to the region of 185 mph.

This 3-liter V12 of Mercedes, which in 1939 won no fewer than seven Grand Prizes, was a great experience. Its high-revving engine which takes hold solidly from 4500 rpm on up, its easily shifted gearbox and already mentioned smooth roadholding all supply an impression of great safety.

At an earlier opportunity I had already driven this car as well as the 5.6-liter and the strength-defying Grandma of 1914 on the wet skid pad, and thus had a preview of what awaited me. Completely new on the other hand was my introduction to the legendary 1½-liter V8 of 1939, which was built in a few months by Daimler-Benz for the Tripoli Race, for which a 1½-liter formula had been announced at the last minute (SCI, August, 1959). Two cars went to the start; two cars driven by Lang and Caracciola won the event, at that time the fastest in the world, ahead of the entire Italian and British opposition.

The two cars suffered a checquered fate after the war, during which they were brought to safety in Switzerland and after which they were confiscated as enemy property. In any case the Daimler-Benz AG succeeded in buying back one of the cars and restoring it to *status quo*.

It was unusually impressive for all those taking part as the racing mechanics filled the tank of their pet, fitted it with cold plugs and applied the starter: the engine turned over a couple of times, caught, and then ran on all eight without spitting or missing—the first time in twenty years and just as easily as if it had last run an hour ago. *(Continued on page 88)*

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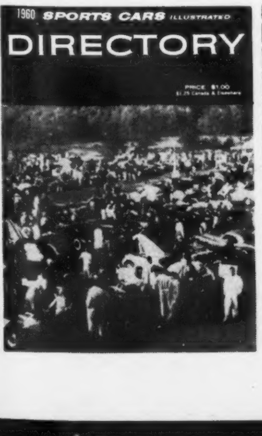

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Paragons Revisited

from page 86

Weighing barely 1300 pounds and having the wheelbase of a VW, this little car was sheer pleasure to drive. Although it revs very high—8500 rpm—and is very sensitive, it's easy and very safe to handle, and everything happened so easily that I had no feeling of having 270 bhp in front of me. Even a part-time enthusiast can drive it comparatively fast because it feels secure and doesn't lead you into situations where very expensive mistakes can be made.

But easier still to drive—much easier than a VW and much safer to boot—is the last in the series: the W196, with which Fangio twice won the World Championship for Mercedes-Benz. This car can be driven in the manner customary today, with arms outstretched; it has effective brakes, a fully synchronized gearbox, direct and yet light steering, and above all a way of tracking and a neutral cornering characteristic that make it a completely equable car that forgives almost every error. With direct injection and positively-closed valves the 2½-liter eight-cylinder engine has as good as no power below 5000 rpm; much more than the supercharged engines it must always be kept between 5000 and 7500 rpm by shifting diligently—only then will it be seen in its best light. Earlier I had always thought that driving a modern Grand Prize car would demand very special abilities—especially if you moved it along relatively slowly. The opposite is the case: any half-way talented driver who is accustomed to the speeds of modern Grand Touring cars can drive the Mercedes W196 fast and safely, doubtless safer even than in his Grand Touring car at the same lap times. I'd like to put it this way: anyone who can reach the very good time of 11 minutes with a Porsche Carrera on the Nürburgring will be able to reach the once-incredible time of 10 minutes in the W196, without great difficulty.

Differences between drivers only crop up at very fast lap times, which begin to show just who has real ability. In other words: he who can turn a Nürburgring lap in ten minutes without difficulty in a car like the 1955 Mercedes-Benz GP machine is doubtless an excellent automobile driver. In a field of 15 Grand Prize pilots with cars having power similar to the W196 he would nevertheless be, by a long way, the last, the tail-ender, and a kind of comic figure for the spectators—so great, once again, is the difference between excellent and first-class drivers.

I don't know how a Ferrari or Maserati of 1955 felt to drive. In any case the Mercedes, with which Fangio and Moss easily ruled the race courses at that time, had from the beginning all the characteristics of complete good nature and very easy serviceability that allowed the ace drivers to concentrate completely on subtracting those fractions of a second. And this, it seems to me, is the most engineers can do to create the right conditions for victory.

—huw

American Grand Prize

from page 35

used the same venturi and carburetor sizes of the larger cars, though in accord with its lower operating speeds it was equipped with larger ram tubes. These necessitated a higher hood bulge. Phil Hill was the first Ferrari driver to retire his car, its clutch apparently not able to deal with the increased lower-end power of the single cam engine. Cliff Allison's car retired for the same reason, though it was powered by a conventional twin cam Dino of full 2.5-liter capacity.

Rob Walker (member of the well-known Walker whiskey clan and owner of both Trintignant and Stirling Moss's cars) had allowed Stirling to fit coil springs to the rear of his Cooper. In Walker's own words, "If there had been an iron bar across the rear end, Stirling would have made the car go equally as well!" The new rear suspension had been tried out on the spur of the moment late in the Fall back in England; Stirling liked its feel, then proved it by bettering the Goodwood lap record. Wire wheels at the rear, and the Colotti five speed transmission were the only other major differences between the Walker cars and the works cars of Brabham and McLaren.

World Champion Brabham had initially practiced in the car that McLaren won the race with. This Cooper had experimental suspension settings that were being tried out for 1960 but not liking the feel of the car and lacking adequate time to set it right, Bruce and Jack exchanged. Even more interesting is the fact that McLaren had not even expected to race at Sebring, for when I spoke with him last October in England (as he vigorously "gunked-off" his Cooper-Climax in the Surbiton shop) he remarked that he was expected in New Zealand for Christmas and intended to participate in the January Grand Prize there. As it turned out Masten Gregory's injuries failed to heal in time to enable him to drive at Sebring and Bruce replaced him.

Attracting great interest at Sebring was the Leader Card 1.7-liter midget, piloted by Rodger Ward. Unfortunately, the greater part of the two practice sessions was spent getting this car to run properly on av gas. The several times that it did appear on the circuit, it was obvious that the few modifications to the chassis to suit it better to road racing were worthwhile. Surprisingly stable and getting through many of the corners as fast as (in some cases faster) much of the field. The red and white Offy differed from normal midgets in having its engine fitted several inches farther forward in the chassis as well as having a supplementary 2 speed transmission installed. This meant that actually there were two 2-speed units, one behind the engine and the other in unit with the final drive gears. But these alterations could never possibly make up for the displacement gap between the perky midget and her overseas competitors. She just wasn't fast enough. Rodger Ward deserves

credit for his spirit and enthusiasm — it was great to see him at Sebring and let's hope it won't be the last time out for an Offy-engined car.

The Lotus effort was no different from previous attempts during the 1959 season. Circlip breakage in the transmission was the root of the trouble according to Alan Stacey. Locked in top gear, Innes Ireland's car was able to finish thanks to the sintered lining clutch while Stacey was not so fortunate.

The Tec-Mec, the space-frame Connaught, de Tomaso's neat looking Cooper-Osca and Harry Blanchard's RSK with center driving position completed the varied field of cars. SCCA stalwart Harry Blanchard has reason to be pleased with himself. Not everyone can finish in the first seven of a Formula 1 event. The Connaught with Bob Said driving drew many interested onlookers. This was the first racing appearance of the space-framed car that was under construction back when Connaught decided to cease building and racing cars. They never sold this one, which embodies many novel design features like a telescoping de Dion tube and servo-operated Lockheed disc brakes.

Paul Emery at one point got it running well enough for Said to turn a 3'27.3 practice lap. The Tec Mec, on the other hand, never was driven quick enough to show up any defects. The only time we know of it actually being driven fast was at Modena last summer when Jo Bonnier took it around the Autodromo for a quick one. His comments were not too favorable. He complained of, among other things, a flexing chassis.

Latest changes in the list of finishing positions transposed Von Trips in Ferrari No. 4 and Innes Ireland in the works Lotus. Von Trips was moved to the sixth spot because of International Race Regulation No. 26 which states: "That cars be classified according to the complete number of laps covered, but if a car takes more than three times that of the fastest lap during the race to complete its last lap, the latter cannot be taken into consideration when computing the distance covered by the car involved." *—jla*

First Grand Prize of the United States
Official Results:

1. Bruce McLaren (Cooper-Climax) 2 hrs., 12 minutes, 35.7 seconds, average speed: 98.83 mph.
2. Maurice Trintignant (Cooper-Climax) 2:12:36.6
3. Tony Brooks (Ferrari) 2:12:15:36.6
4. Jack Brabham (Cooper-Climax) 2:17:53.9
5. Innes Ireland (Lotus) 2:15:49.4
6. Wolfgang von Trips (Ferrari) 2:12:42.0
7. Harry Blanchard (Porsche RSK) 2:16:34.2

Fastest lap: Trintignant (Cooper-Climax) 3'05.0" 101.13 mph (161.80 kph)

The best overall training times for the first American Grand Prize:

Stirling Moss, (Cooper-Climax)	3'00
Jack Brabham (Cooper-Climax)	3'03.0
Tony Brooks (Ferrari)	3'05.9
Maurice Trintignant (Cooper)	3'06.0
Wolfgang von Trips (Ferrari)	3'06.2
Cliff Allison (Ferrari)	3'06.8
Phil Hill (Ferrari)	3'07.2
Innes Ireland (Lotus)	3'08.2
Bruce McLaren (Cooper-Climax)	3'08.6
Roy Salvadori (Cooper-Maserati)	3'12.0

Starting Grid

Moss Brabham Schell
Brooks Trintignant
Trips Allison Hill
Ireland McLaren
Salvadori Stacey Said
de Tomaso Constantine
Blanchard D'orey Ward

Man Who Made Tomorrow Come

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Versuchs-Werkstätten (WVW). Using Wankel's sealing systems, the DVL was able to get a rotating-disc-valve motor running. Back at the WVW, Wanket set up apparatus for testing sealing parts for a cylindrical rotary valve, under high temperatures and at sliding speeds of near 1000 feet per second. The first aircraft engine with such a valve went on the test stand in 1940.

Investigations in rotor engines with axes both parallel and at right angles occupied Wankel's time in 1938, and in 1939 he developed a method of cooling the pistons in an aircraft engine. A year after the expansion of the WVW in 1942, collaboration began with Daimler-Benz in the construction of aircraft engines with cylindrical rotary valves, and mass production of Wankel's sliding seals began. These engines were installed in aircraft and proven to be practical in 1944, leading to joint contracts between the DVL and WVW and such firms as Auto Union, Hanomag and NSU. When the war ended, contracts with Daimler-Benz and with Borsig had been added.

As part of his relatively private experiments toward a rotor engine, Felix Wankel had built an adjustable rotary compressor in 1944. All this work was abruptly halted in 1945 when the French occupation forces destroyed the WVW and imprisoned Wankel until 1946, when he bounced back with undiminished zeal, constructing workshops in his former home.

When I visited him some time ago in his newly equipped studio for technical development at Lindau, he spread out some tiny steel sealing strips before me, carefully packed in plexiglas sheets like bacteriological cultures. On seeing these, I was confirmed in my belief that the atmosphere of his parental home had fostered in him a feeling for biology. Only a man who can recognize modes of "life" in machines which obey biological laws would be able to classify the countless possible systems of rotor engines according to type and family. In this way he resembles the naturalist Linné to whom we owe the classification of all kinds of plants and animals.

Through the system Wankel set up in 1947 — the first time this had been grasped by one man — he discovered additional new types of engines and was also able

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Man Who Made Tomorrow Come

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to eliminate those which seemed technically impractical.

With this, the net drew tighter. The rotor engine project became known to the NSU factory, which since 1951 had been interested in Wankel's rotary valve knowledge and its application to motorcycle engines. His plans were also known by Borsig in Berlin, who had given Wankel a contract for the development of a rotary compressor, and by the Goetz piston ring factory in Burscheid, with whom Wankel also collaborated. Through its research director, Dr. Froede, NSU ventured into the rotor engine project with Wankel in 1953. Although NSU temporarily withdrew from the project, work began once more in earnest in January 1954, encouraged by Wankel's latest proposals.

It will be the year 1954 that's entered in the textbooks of physics in reference to the development of a "more logical" engine. Among the types of rotor engines known to him, Wankel discovered, on Saturday, March 5th, a housing form which promised a sufficiently large working chamber which could expand and contract continuously with the help of a "rotor" circulating within. (The general shape of both the housing and the rotor are described in full in SCI, February, 1960 – Ed.). On the following day Wankel made position drawings for each phase of the movement of the triangular rotor, wondering anxiously whether a four-cycle sequence would be possible. When he was able to prove, by Tuesday, March 8th, that the rotor was able to perform compression continuously, Wankel knew that he was on the right track. The next tests – again carried out on the drawing table – concerned the no less important question of whether this remarkable rotor would also be able to control the entry and exit of the gases in sufficiently large quantity. Whether, in other words, the engine could "four-cycle" without any complicated valve machinery. A workable rotor engine had to stand or fall on this decisive point.

I have seen these original phase drawings and found, sketched with thin pencil lines, his first proposals for the intake and exhaust passages. First of all, as Wankel described it to me, a few guesses were put on paper. But the drawings made in the next days and weeks showed what Wankel and his engineers had found: this system followed the four-cycle sequence perfectly. This was the decisive point. The lower right-hand side of the drawing bore the date of April 13th, 1954. A working rotary engine had been discovered, even if its components revolved only in the form of paper discs on an ingeniously-conceived testing device.

The speeds of the rotor and of the rotating housing surrounding it are in the proportion of two to three in this early engine, which meant that the relative speed between them was not excessive and would allow reasonable velocities for the very critical sealing components. In this original engine the outer rotor, or rotating housing, was the power-producing component. As could be seen on the construction drawings that took shape soon afterward, the fuel-air mixture was led to the housing through the rotor's hollow shaft. It flowed from openings in the shaft sides through channels in the walls of the housing into the momentarily half-moon-shaped working chamber. This particular path for the mixture was conceived by Dipl.-Ing. Hoeppner, the chief designer in Wankel's technical workshop. On each face of its triangular body, the inner rotor carried a special spark plug which received ignition current through the hollow shaft from a contact rail. The exhaust gases slipped away into the open through a port in the rotating housing.

After Prof. Baier of the Stuttgart Technical High School mathematically described the curves of the rotor and housing (as epitrochoid) to facilitate the construction of a cam grinding machine, this engine was built in Neckarsulm. After intermediate investigations with models, and pump or supercharger versions, the first rotor engine went on the test stand on February 1st, 1957. At the first starting attempt the engine fired spasmodically. After the carburetor was adjusted a run of several minutes could be made during which a measure of output was possible. A rival to the piston engine had arrived; logic had overcome tradition.

Further experimental engines were built in 1957 with better cooling and sealing, with a chamber size (we can no longer say "displacement") of about 125 cc. It was possible to develop 29 bhp at 17,000 rpm and to run continuously for as long as 100 hours. Soon thereafter, by a "kinematic conversion", NSU transformed this rotating-piston engine into a circulating-piston design while retaining all the existing component shapes. This new version is the one currently being developed both by NSU and Curtiss-Wright, and is the variant described in SCI last month. Great simplification was effected by making the housing stationary and only allowing the rotor and its shaft to move about. Lubricating oil was now used to cool the rotor, while the housing was water-cooled. The engine could run either with pure gasoline or with the fuel-oil mixture with which the test runs were carried out. The latter took place a year later in a very promising manner, with engines of 125 and 250 cc.

In the same year, 1958, Curtiss-Wright took out a license from NSU and Wankel and began to carry out a parallel development program. Impressed by the potentialities of this new prime mover, they halted all development on their own piston engines to apply their entire research staff to the new engine. It's their goal to make the rotor engine usable in the range of small and medium power outputs in which neither the economy nor the weight of the turbine are satisfactory. Since Curtiss-Wright set out on this with incomparably larger resources of personnel and finance, in less than a year it had obtained the same successes that had occupied several years of experimental time in Germany. It was also Curtiss-Wright that pressed to bring this project into the open, while those at NSU held back, hoping to be able to refer in the future to still more success.

Seldom within a man's life is there an opportunity to investigate a really meaningful new development like this one. I was fascinated by its history, but even more by the man Felix Wankel, whose twinkling eyes behind thick-lensed glasses reveal a wry sense of humor. He merits being called a human being of the finest caliber as well as a researcher of the same class. I was similarly impressed by the ambition of Dr. Froede and his staff. And you will understand that after the first ride in a car equipped with a rotor engine, I put the calendar page of that day among those important documents that every man possesses. The car was an NSU Prinz but its engine was practically impossible to find. Its tiny circular housing, anchored to the end of the disembowelled Prinz crankcase, was smaller than the gearbox or the cooling equipment and barely visible below the generator and carburetor. Vibration, too familiar in the piston engine, could not be felt either at standstill or under way. Reminiscent of a powerful electric motor in its sound, the engine had a faultless idle and was connected to the normal gearbox – governed, of course, to a usable range of rpm.

We can only guess at the eventual size of the revolution now breaking out in the realm of the internal combustion engine. There can no longer be any doubt that there will be a revolution. The rotor engine set in motion on the test stand at Neckarsulm occupies one-fourth the space of a piston engine of comparable output. It is insensitive to speed, and since it has no unbalanced masses it is dead smooth. The rotor, moving like a planet in orbit within its housing, is the only circulating part. It is a four-cycle engine with the simplicity of a two-cycle, yet it can out-perform either with ease. It promises inordinately low manufacturing costs. In respect to specific output and fuel consumption, it can already cope with the best piston engines that we have today.

Furthermore, it seems that the new engine is unusually insensitive to fuel quality. In fact, while endeavoring to determine this, BV Aral, a large German fuel company, had the greatest difficulty in producing a gasoline that was sufficiently poor. Wankel's engine will digest knock-prone fuels with octane ratings as low as 40, a fact that is not likely to be inconsequential to fuel manufacturers.

Felix Wankel had the unique gift of being able to see an idea through to the end. The board of NSU had enough of that rare commodity, pioneering spirit, to grasp the idea. Judged against the 80-year development life of the piston engine, the NSU-Wankel power unit is running successfully after an unbelievably short time. It appears to have an extraordinarily bright future. Like those in the past, this revolution too will evoke great upheavals, battles, and counterattacks. The piston engine stands by prescriptive right firmly, securely, and most reliably on its own two feet. But these feet "go back and forth"! The logic of circular motion—the fundamental movement of the universe—is too compelling.

—dk

Nassau Was Nice

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Scrutineering on Wednesday – Monday and Tuesday's activities are best left cloaked by the mists of time – brought to light a number of interesting cars. Three birdcage Maseratis having rear-end ratios and carburetor jets changed to enable the drivers to stay within the fat part of the power curve on slow corners. Carroll Shelby's monster Maserati – complete with form-fitting driving seat upholstered to match Carroll's Farmer Brown-type driving overalls – up on four pylons for attention to the brakes. In practice this big, white Maserati seemed to be quite a handful in the corners, albeit a blur on the straights. The transition from straight-line streak to corner-clinging sports racer seemed to demand all of Shelby's not inconsiderable talent. A Ferrari-Maserati from California – that state being the leader, we imagine, in unthought-of engine swaps – had its Maser engine completely out for a clutch replacement. Speed Week's one and only Scarab Mk III was sufficiently undressed in the hangar-garage area to enable one to examine the chassis workmanship. Only the Porsches had better finish and attention to detail. Some indication of what Ferrari will field for sports car racing during 1960 was had by examining the brand-new car entered by Ricardo Rodriguez. Externally similar to last year's car, it was powered by a single-cam (one cam for each bank of three cylinders) V6 Dino engine. In practice, under Ricardo's direction, the car went very well. It did not reach the starting line of the big race due to a blown gearbox; reports were that the cogs' were mashed on the short trip from the garage area to the pits. Ah, those Latin mechanics!

Naturally, the cars that created the most interest during inspection were the Tipo 61 2.8-liter Maseratis. Nassau was to be their first major race, and everyone was curious as to just what they could and would do. One car was owned by Team Camoradi and had been driven in practice by Dan Gurney, Joachim Bonnier, and Carroll Shelby. The tall Texan drove the car on the big day after Gurney was felled by a Kart on Saturday night, and Bonnier elected to stay faithful to his Porsche. The second car was owned by Mike Garber, and piloted by Gaston Andrey, while the third machine was handled by owner-driver Loyal Katskee. The best Tipo 61 time was posted by Gurney – 2 minutes 57 seconds – which was very close to Moss's top time of 2 minutes 56.5 seconds. On the big day one out of the three cars finished. Shelby's car – reputed to have had 1000 miles of testing on it before the race – retired with a broken deDion tube, while Andrey on the 48th lap tangled with a slower car blowing a tire and punching a hole in his gas tank. A birdcage Maserati was in the lead for 30 of the 49 laps of the big race. This performance would seem to augur well for the Tipo 61's future.

Mandatory practice on Thursday gave this writer an opportunity to watch, for the first time, one of the world's top practitioners of the art of road racing in action. Using the slightly long-in-the-tooth DBR 2, Moss, without pushing, clocked times that proved his world standing beyond the shadow of a doubt. However, it was not so much what he did but how he did it that was impressive. One small incident might serve to prove our point. Moss was waved past by a Ferrari driver just before the Esso bend; both went through almost side by side at a good speed with the Aston accelerating away toward the end of the corner. At the point when things looked most hectic, Moss – very casually – waved a thank you to the driver of the other car. It was at a spot that required, for most drivers, both hands and both feet plus a little body English . . . a little like watching Yehudi Menuhin scratch his ear in the middle of Flight of the Bumble Bee. One other point. Moss borrowed Johnny Cuevas's Porsche and after two or three laps turned a 2:60 – Johnny's best – and he is several notches above the top amateurs – in the same car was 2:64 to 2:65.

Friday saw the running of the Governor's Trophy race. Run in two sections for over and under 2000 cc cars, the winner in the big car go was Moss in the Aston while Bob Holbert in an RSK Porsche won the small car feature. Three seconds behind Holbert was Ricardo Rodriguez in the new 2-liter Ferrari. As a shakedown cruise, it was pretty impressive. The next day's events – Bahamas Cup Awards – were devoted to more or less fun-type racing. There were two races for Nassau residents, two races for the ladies, an all-Porsche race, an all-Healey race, and an

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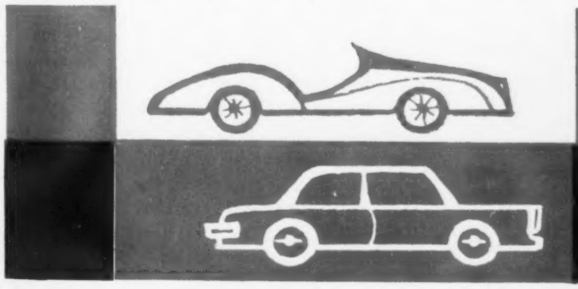

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Nassau Was Nice

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event for Ferraris only. James Coley, service manager for Caribbean Motors in Nassau, after winning all of his races for the day in a very decisive manner, impressed as a more than competent driver. This promise was more than fulfilled on Sunday when he won the residents-only race, and hung on grimly to Bob Grossman's Ferrari California for a second in the Nassau Memorial Trophy sprint. The all-Ferrari race turned up a gem of a battle between Phil Hill and Pedro Rodriguez. Pedro took the lead in the first lap, held it until the fourth when Hill took over. It was a classic example of youth trying to re-arrange the established order.

Saturday night was listed as an evening of Kart racing. The only problem was that the feature ended at 2 a.m. — so that the billing should have read "an evening and morning of Kart racing." Jim Yamane won the 100-lap feature on board his home-built Kart powered by two McCulloch engines. He and his wife flew from the West Coast with the Kart on board as excess baggage. Try that on your Porsche or MGA. Several of the top drivers had been billed to drive Karts. The only two that showed in working clothes were Eddie Sachs and Dan Gurney. Both should have forgotten about Karts. Sachs' machine was powered with a Villiers motorcycle engine mounted between the driver's knees. Mechanical distemper prior to the start denied Eddie a ride. Dan Gurney had even worse luck. He started in one of the openers, became enmeshed in a haybale after the first few laps, and was on the way to the hospital shortly afterward. The compressed horse food hadn't bothered Gurney or his Kart, but a competitor charging head down through the turn did. Dan — with his back to traffic — was lifting his machine out of the hay when he was kart-struck about the ankles. He went down like a badman in a TV western. His injuries — a cracked bone in the right foot and a bad cut — sidelined him for the big go on Sunday. If raced hard — and with $2000 worth of prize money in the offing that's just what the boys were doing — Karts can be dangerous. As a suggestion: the Kart people should talk to some of the old midget track officials on how to run batches of high-powered cars on short tracks with a minimum of confusion and accidents.

Up early on Sunday morning with Karts and Calypso still ringing in our ears, we made our way out to the Oakes Field course for the big go. Unknown to all present the result of the main race was decided long before the cars lined up for the Le Mans start. The Aston mechanics — with some help from neighboring pits — were practicing pit stops in order to get Stirling in and out during the race in the shortest possible time. During the rehearsal a zealous helper managed to put a jack through the already repaired gas tank of the big green DB 4. Another, and of necessity even quicker repair than the first, was made. Moss's grab for the $13,000 prize money, however, had been jerked out of reach by a mishandled jack. The lineup for the Le Mans start at 2:30 contained just about every type of sports-racing car manufactured. Ferrari, Porsche, Aston, Lotus, Elva, Maserati, Scarab, Sadler, Cooper, Lister, Bocar, Corvette, Austin-Healey, AC Bristol, OSCA, Fiat Abarth, and Deutsch Bonnet were all represented on the line. Drivers fidgeted as they stood separated by the width of the track from the cars that they loved, hated, or were indifferent to. The noise level at track side gradually dropped as the zero hour approached. When Dean Delamont, Secretary of the Royal Automobile Club, lowered the flag from the starters box high atop the Esso Bridge, the drivers' feet could be heard scrambling and scratching for traction on the rough-surfaced track as they started the short sprint for their long fast ride. Within seconds doors began slamming, starters whining, and engines coughing and spitting into nervous life. A surprising first away — considering that the fastest Le Mans sprinter in the business, Stirling Moss, was among those present — the blue Meisterbrauser Scarab with Jim Jeffords at the wheel simply stormed under the bridge with gouts of smoke sprewing from its madly-spinning rear wheels. Fifty cars screamed their way into the first bend before Moss, frustrated by a jammed starter switch, could get the big DBR 2/370 into action. At the end of the tenth lap Shelby in the birdcage Maserati was in the lead with Andrey in a sister car second trailed by Jeffords in the Scarab. At 20 laps the order was Shelby, Jeffords, and Andrey. After 30 circuits Shelby was still in the lead followed by Jeffords, Andrey, Constantine, and Moss. Stirling started to make his move on the 34th lap when he moved into the second spot. His oft-repaired Aston withstood three laps of this all-out motoring before it gave up the ghost. George Constantine, running consistently just behind the leaders in the other Aston, was in a beautiful position to continue the attack. This he did until the checker confirmed his win of the sixth annual Nassau Trophy race.

—ww

NASSAU TROPHY RACE

Driver	*Times*	*Laps*
George Constantine, Aston Martin	9096.47	49
Phil Hill, Ferrari	9127	49
Bob Holbert, Porsche	9177	49
Jack Brabham, Cooper	9186	49
Joachim Bonnier, Porsche	9250	49
Harry Blanchard, Porsche	9285	49
Jim Jeffords, Scarab	9102	48
Count Von Trips, Porsche	9142	48
Alan Connell, Ferrari	9160	48
R. K. Thompson	9181	48

Coming Next Month

DAN GURNEY
A word picture of one of America's up and coming young drivers.

RSK REPORT
Ride with Richard Von Frankenberg in the latest sports racer from the Porsche Factory.

Dodge Dart

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varies to suit the prospect, so does the engine output. The old definition of a sports car as a car which may be used for competition as well as for everyday motoring can possibly be used to justify calling the D-500 Dodge a "sports dragster." For those particular customers, who as keen car-owners wield an extraordinary influence on their less competitive neighbors, the D-500's Ram Induction is a blessing indeed. It gives an already hot engine with lots of top-end performance a new strength in the lower rpm range. This may presage a new horsepower race but the absence of any HP figures in the general publicity releases would indicate that the factory management believes that hot engines are "out" with the general public.

Ram-tuning has existed so long that our first reaction was simply, "Why didn't we think of that?" Tuned intakes and exhausts are deservedly popular in the racing game; by selecting the appropriate length of manifolding, you get literally free horsepower at the corresponding rpm.

Here's how it works. When each intake valve opens, a negative pressure wave speeds toward the carb intake. This is a pressure or sound wave, and doesn't conflict with the movement of gas and air into the cylinder. When it reaches the "atmosphere," in this case the large plenum chamber under the carburetors, a positive pressure wave echoes back towards the valve. No matter what the rpm, this journey takes the same time, the velocity of sound in a mixture of air and gas being about 1000 feet per second, depending on temperature and pressure.

If the echo arrives as the intake valve opens, it will assist in filling the cylinder with mixture, in this case, about 10% more. Because of the twisting path through the long manifold, what started as a sharp pressure drop returns as a gentle pressure rise. Thus the "supercharge" occurs over a wide band, from 1800 to 3600 rpm. For further information on this phenomenon, see page 47, SCI, July, '57.

No one has used this organ-pipe principle before in non-racing cars because of the great lengths of pipe needed to obtain the gift-wrapped horses at usably low revs. Besides, ram tuning requires separate ports and manifolding (and preferably carb venturis too). The Dodge heads, of course, already have separate ports while the rest works in well with the ever-present desire of the stylists to lower the hood line. With peak torque at 2800 rpm, the D-500 needs over thirty inches of piping. This, happily, allows them to hang the two carburetors outboard of the already wide engine. Though cast of aluminum in two units of four, there are eight separate manifolds writhing their way snake-like across the V8.

The nicest thing about ram-tuning is that is requires no special fuels. There's nothing mechanical to cause trouble and the added performance is there to use or not as you desire.

Though the extra 10% torque may not be significant for highway driving, it appeals strongly to the drag-strip enthusiast who measures acceleration in microseconds. It is especially useful for the driver who would own a successful "sports-dragster," one which wins trophies on Sunday and takes the kids to school on Monday.

Really serious competitors may wish to order the Dart with the large Dodge's D-500 engine (the Super Red-Ram).

We hardly consider ourselves as drag-strip experts here at SCI, but we were impressed with the smooth, relentlessly strong thrust from a standing start. The "Sure-Grip" limited slip differential ($49.70) minimized the wheelspin (20 mph showed immediately on the clock) and with a stopwatch-carrying passenger aboard, 0-60 was timed at eight seconds while the quarter-mile came up at 16½ seconds at between 85 and 90 mph, just as the TorqueFlite (standard with the $413 D-500 package) makes its shift into direct drive.

After the runs, the 361-inch engine "panted," its idle hunting through a 2½ second cycle for 15 seconds as it sought to "catch its breath." Perhaps this was a correctable malfunction rather than a design weakness. If so, it points up the sad truth that complex machines demand careful attention to obtain their utmost.

Unfortunately, the very manifold that donates so much urge traps the valve covers completely. Plugs are outboard under the exhaust manifold.

During these runs we had good opportunity to sample the brakes which had just been re-lined. (Previously they had pulled erratically). As we expected, they protested aromatically, but with the two to one power boost they always stopped the car surely.

Throttle response was too touchy for us, though friends who drive domestic automatics regularly could start off with imperturbable smoothness. Even on hills, the 750 rpm idle was enough to make the Dodge creep forward, and when cold, the engine's even faster idle would tow you right along. The equally cold brakes would usually squeak especially if you used them to slow the car rather than halt it.

Relying too much on the limited-slip "Sure-Grip" differential, we managed to get stuck in some sand near Cape Cod's wintry beaches. Seven inches ground clearance (only five at the mufflers) sounds like enough but we were fooled. All hands present heaved-ho and we soon had the nearly derelict Dart back on firm ground but, alas, someone's knee had dented the thin aluminum grille. We're used to small cars having parking problems due to too-low bumpers, but it's quite a start to find domestic cars getting soft around the bumpers, in the one area where they've always had it all over the imports (literally).

Shifting the Torque-Flite is controlled by a row now of five buttons, R, N, D, 2, and 1. We still feel that a lever is easier to grasp quickly and that the only virtue in push-buttons is that they "sound modern". Edsel gave them up, but that's no encouragement. Button 2 does not limit

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Dodge Dart

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you to second of three gears, instead it raises the speed at which shifts take place. This applies to both up and down-shifts.

The heater is controlled by a balancing row of five buttons to the right. Its operation and their significance were too much for us and we retreated to the owner's manual. We still find it hard to accept that you can't have fresh, slightly heated air without the blower going.

Cornering, benefitting from the asymmetrically mounted rear leaf springs and affected by the super-strong power steering, was always very light. If you punch the neutral button and switch off, though, not so. Despite the strong forward weight bias, the steering felt consistent up to very high cornering forces, indicating that the rear wheels were doing a fair share of the job. The car is huge, yet very nimble. On rough roads, violent cornering will cause the suspension to thump against its stops, creating a certain amount of "cockpit confusion." Running straight on choppy roads, the ride is better than we'd expected, even for an American car.

Chrysler Corporation engineers are justifiably proud of their new "tuned" engine mounts. Their spring rate is so chosen that the engine's mass is used as a vibration damper. On any car, as the suspension is jolted by an uneven surface, it gives the engine complex a jiggle which also becomes an oscillation. What the Chrysler engineers have done is design the mounts so that the engine complex vibrates out of phase with the rest of the car. Everything may be vibrating but the people inside don't know about it. Simple, but sophisticated.

Many people criticize the full-time power steering as too light, but owners invariably claim to have grown used to it within a week or two after purchase. Once hooked, they insist they'll never give up such lightness of control. They may have something there, because the heavy-steering (though precise) sports car has certainly gone out of fashion now that designers know how to combine accuracy with delicacy.

What nobody seems to know how to accomplish consistently in America is quality workmanship. Curved windshields help sell cars, but no one here or abroad seems to have found an economical method of making them with anything like the optical quality of flat plate glass. On the test car, there were about a dozen flaws near the left end of the windshield, which made long-distance driving very tiring visually.

Our complaint to the Dodge News Bureau elicited this information. They had been very anxious to get "any car at all" for the press and had therefore taken this "reject." They too were displeased, and had been assured that Pittsburgh Plate Glass themselves would replace the windshield free of charge.

For the individual buyer we can only offer this suggestion: Cars coming off an assembly line one after the other can and do differ greatly in quality. When you buy a car, look it over extremely carefully before accepting it, checking the operation of all doors, windows, hood and trunk lid. Look through as well as at the windshield. If you don't like what you find, complain right then. Don't wait until the guarantee is about to run out.

Properly handled, integral construction confers these advantages over conventional separate body and frame designs: Greater strength for the same weight, and a longer lasting, safer chassis that is free of rattles.

A road test can hardly last long enough to determine the durability of a car, but we had ample chance to note the good fit of the doors and trunk lid. The hood was very difficult to unlatch and made the typically American thunderclap when slammed shut. As to rattles, there were none. We thought we'd found one but it turned out to be a bottle of windshield squirt in the glove compartment.

Our staff's opinion is that integral construction is safer in a collision, *all other things being equal,* than cars whose bodies are bolted to a separate frame. The logic is that without a super-rigid frame, the extremities of the body will collapse gradually, soaking up energy just as the resilient lining does in a Snell Foundation helmet. Though sheet steel's non-return characteristic may save your life, the drawback is that the car with the separate frame can later have the frame straightened and the body panels hammered out to suit. Integrally built cars are not as easily repaired, though we are not yet at the stage of Kleenex-like disposable cars.

It's flogging a dead horse by now, but for a six-passenger car, there isn't much room for the third and sixth passengers. Since their comfort is determined as much by the seat cushions' spring characteristics as the suspension's, not much can be expected if it's possible to bottom out just by bouncing up and down.

The driver's seat not only provides no lateral support, it feels as if you were sitting on top of a big fat pillow. Whenever you are turning it feels as if you'll tip off of it. There is lots of leg room and lots of adjustment, however.

The steering wheel marks a step forward. At "three and nine o'clock," the surface of the plastic rim has been finely textured so that your hands will grip even when they have perspired. The upper arc of the rim is clear, transparent plastic with shiny fragments strewn through it. They appear to be aluminum chips.

While the wheel displays a combination of utility and styling appeal, the horn ring could use more attention. First, it's highly polished, which isn't bright at all. If driving into the sun, its compoundly curved surface will reflect nastily in your eyes. Second, its edges, around back where your fingertips rest, have not had the casting flash ground away. Not dangerous, but it gives the high-styling a nickel-and-dime feel.

The name Dart appears nowhere on the car, so maybe this is one medium-price brand smart enough to avoid extinction. Soon, perhaps, all Dodges will be Darts. As for this year, 1960; here it is, it wasn't so sudden at all.

—sci

Drive A Junior

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For a subnormal-agility type like myself, the cockpit isn't too accessible either, at least without treading on too much tissue-thin tinware. Not, once inside, is there an excess of leg room for an individual of any length. As usual, the most troublesome aspect is interference between the steering wheel and the leg which is groping for the brake pedal. For anybody below 5'8", which includes most Italians, there's plenty of room. The straightforward bucket seat offers good thigh support to anyone whose legs can get down that far. You sit low in the Taraschi—lower in relation to the body than in practically any other Junior — which limits your view of the front wheels and enhances the impression of being in a good Italian sports/racing car, already strong because of the left-hand driving position. Yet vision is fine in every other sense from the well-shrouded cockpit.

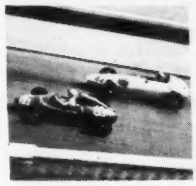
A big tach is high and prominent on the dashboard, which carries three other gauges (unusually lavish for a F.Jr. car) and minor controls. Over on the right side of the cockpit there's a three-position control for the customary radiator blind. When brought to life with the pull-type starter this race-tuned Fiat bellows and coughs through its megaphone exhaust like the G.P. cars the Taraschi resembles externally. It naturally wants to be kept revving high during off-duty moments.

With a clutch that's positive yet smooth it's easy to get the car away, and to follow up with gear changes that snick through neatly. Taraschi rates his engines at 78 CV. at 6500 rpm, a speed which this one would readily turn up. In just-off-the-boat tune this engine lacked absolute razor sharpness in feel but was still lively enough to provide a real kick in the back. Acceleration would equate to that of a good 1100 cc sports/racing car or of a hot Class F production machine. Fortunately, for the car's performance over a road course, the engine pulls well from 3000 rpm on up, delivering useful punch over an unusually wide rev range. To match this the brakes are strong and stable, a slight tendency to lock showing up mildly under our very wet test conditions.

A damp track also made it hard to come up with concrete descriptive terms for the handling, which in any case is very good indeed. Weight distributed well to the rear and the absence of torque reaction at the axle combine to give gripping bite both in and on the way out of corners. Absolutely all the power available can be put to good use. The same good balance and traction contribute to handling that's near-neutral in feel and as forgiving as a car this fast can be. Steering is only moderately quick, and the overall impression is a familiar and very satisfying one. It's a heart-warming kind of car to drive.

The specific ability of the Taraschi was well-proven at Sebring, where George Constantine kept it up amongst the leading clot of Stanguellinis, providing the only real competition for the cars of the Sorcerer of Modena. And this in spite of a lack of tuning data from Taraschi and an exhaust pipe that worked its way loose, markedly reducing the extractor effect. When the "Biener Special" and more like it are tuned and on the line they should provide much-needed competition for the cars that threaten to turn this formula into a one-make affair. As more people try Junior cars, and experience the exhilaration of being on your own in a snarling, vivid little automobile, the class can't help but grow.

—kel



American Juniors and Seniors

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ARTICLE 3—Mechanical Parts.

a) Any part produced and sold by the factory for a touring car shall be considered as meeting this requirement. Crosley engines are considered as meeting this requirement.
b) Production (minimum 1000 in twelve months) motorcycle gearboxes are acceptable.
c) Any braking system fulfilling F.I.A. requirements is acceptable, be it disc, drum, or other method. The system shall be so constructed that, following any single failure in the braking system, adequate braking power will be retained in either the front or rear pair of wheels.
f) The starting device shall be any system whereby the driver, alone and unaided, can start the engine several times from the cockpit of the car.

ARTICLE 4—Coachwork

The roll bar shall project higher than the driver's helmet and shall be within 6" of the normal position of the driver's head. It shall be capable of sustaining a load equal to at least five times the weight of the loaded car.

ARTICLE 5—Weight

Of the total weight of the car, no more than 22 pounds (three gallons) shall be in oil, and no more than 42 pounds (five gallons) shall be in water. Such two-cycle engine mixing oil in the fuel will be weighed without lubricant.

Methods of attaching ballast, if required, must be approved by the technical committee.

ARTICLE 7—Forbidden Practices.

a) Crosley single-overhead-cam engines are exempted from this rule.
b) Fully locked differentials or driving axles are permitted.

Further clarification at this point comes from Stuart Dane, who is very active in the 500 cc Club and in the construction of an MG-based Junior car. Dane adds, "The extra classes were established mainly to allow the use of many more available engines, and to keep the cars powered by these units on fairly equal terms. The 1300 cc class was included primarily to bring in the plentiful MG engines, as well as to attract owners of currently operating MG specials into the Formula racing fold.

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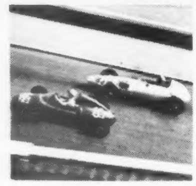

American Juniors and Seniors

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"The 500 cc Club solicited suggestions for the new Formula and received a large response to the request. Almost all those who took the trouble to write wanted to make some sort of change such as: a 1500 cc class, Crosley engines, outboard engines, motorcycle engines, etc. The general tone was 'Hang the International Formula! We'll never get to go abroad anyway.' This seemed pretty reasonable because the main reason for the existence of the Formula was to provide cheap racing, and the people interested in it for that reason can't afford to go more than a few hundred miles to a race in any circumstances. With this in mind, the 500 cc Club undertook to provide a set of regulations which would allow the builder the greatest possible freedom in choice of components, but still keep the cars built to the modified rules on even terms with those which conform tc the International Formula." Mark Brunnei adds, "We used the F.I.A. handicap factor of .80 pounds per cc, a decision that was subject to mch controversy in our ranks. It now appears that this might be a little conservative. In other words, the large-capacity cars seem to be carrying too much weight to stay with the Stanguellinis."

Brunner goes on, "We're prepared to change these rules according to experience. We know from the past that if a rule isn't sound it will die a natural death. For example we used to have a rule which permitted 250 cc supercharged cars to run in Formula 3. This sounded inviting on paper but no one built such a machine, and the rule was dropped after a few years. I do believe that the international regulations are due for some revisions. At that time the United States F.I.A. committee should have some concrete proposals ready. These will have to be backed up with facts which we hope to have by that time."

These thoughts behind Formula B seem sound enough to us. European cars conforming to the F.I.A. rules can race competitively here, while only a few of the American-built machines wouldn't be able to race abroad. In the meantime the wider selection of engines (though we still doubt that MG parts are all *that* plentiful) will help Formula Junior on its feet in this country. Later, as Mark Brunner implies, the F.I.A. might even be persuaded that the 1300 cc and 750 cc classes have international validity.

The 500 cc Club has, then, adapted Formula Junior to American requirements without voiding the eligibility of cars built according to the international rules. This is a reasonable step, but is about as far as we should go in modifying the existing formula. As Stuart Dane asked, though, "What happened to SCI's suggestion of a few months ago regarding an American Junior Formula using domestic engines?" When we broached this idea in May it was hornswoggled by the fact that any American Junior powered by a 4½ liter Chevy V8 would hardly be a safe, cheap machine on which to begin a racing career. In inexperienced hands it would, in fact, be a menace. But now that the compacts have arrived the situation has changed a great deal. It would now be feasible to compose an American Junior Formula around the compact engines and components and have some very effective racing cars that would still be reasonable to build and drive.

SCI isn't the first to come up with this thought. The emergence of the compacts happens to coincide with the time set by the F.I.A. for investigation of a replacement for the existing 1½-liter Formula 2, a class that will be redundant when the new Formula 1 makes its bow in 1961. The man who invented Formula Junior, Count Giovanni Lurani, has framed some suggestions for a new Formula 2 that tie right in with a genuine American racing class. Here's the way he presents them:

"Since the beginning of Grand Prize racing the authorities in charge have realized that it's worthwhile to establish a spare formula, perhaps less important than the concurrent G.P. formula, that would allow a wider variety of technical experiments and induce more and different car builders to enter the fray. Glancing at the past, we see that this Formula 2 has most often been obtained by roughly cutting in half the displacement limit placed on the Formula 1 Grand Prize cars. Should the Commission Sportive Internationale, meeting to discuss this subject in late January, decide to do the same in 1961 when the big cars will be limited to 1½ liters?

"This would produce a 750 cc, unblown Formula 2, which is likely to be an expensive proposition and to provide performance and spectator appeal inferior to that of Formula Junior. What about simply using Formula Junior, provided with a new name? When I suggested this formula late in 1956 and proposed it to C.S.I. early in 1958, I had completely different intentions for it. Designed to be reasonably cheap and very popular, these little single-seaters would lose all their appeal if they became Formula 2 cars. What else, then, can be done?

"The death warrant for our current 2½-liter Formula 1, effective at the end of 1960, was signed in London in October, 1958 under pressure from some negative daily newspaper campaigns and from certain political powers, on the assumption that racing could be made safer by reducing cylinder capacity and hence power. Since then most observers have realized that this decision was probably too hasty and that racing risks aren't directly proportional to power.

"As will be the case with the 1961 formula, a Grand Prize limit has often been derived from the Formula 2 that preceded it. But sometimes the opposite has happened and the spare formula has descended from one of the discarded G.P. formulas. For example the 1½-liter Formula 2 cars of 1933-1939 were the offspring of the Grand Prize cars of 1926-1927, and in some cases were the same automobiles (1500 cc Delage) successfully modernized.

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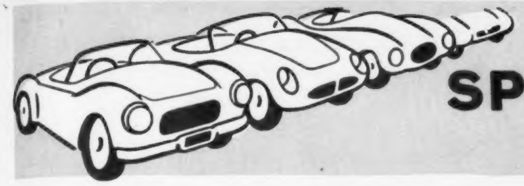

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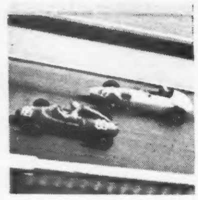

American Juniors and Seniors

from page 96

I believe that we have now reached a point where a similar solution is imperative. As one of my proposals for the C.S.I., I suggest that the new Formula 2 be in fact our present 2½-liter Formula 1. This could also become the much-discussed Intercontinental Formula, which would prolong the life of the existing G.P. cars and perhaps help to bring American and European racing closer together.

"If this first proposition doesn't work, we'll have to try to find something entirely new. New in detail but not in concept, because I've already planned a so-called Formula Senior. The idea would simply be to adopt the tremendously successful scheme of the Junior cars, broadening their strict regulations and allowing overhead-cam engines from cars homologated in the Grand Touring category (100 cars built per year, two-seater and special bodies allowed).

"The problem that remains is to set a displacement limit that will allow truly international competition. At the 1½-liter level we encounter engines like the Fiat 1500 Sports, single-cam Coventry Climax, MG Twin-Cam, Porsche, etc.—a strictly European array, as would be found at a 2-liter limit, with Bristol, Mercedes and Triumph engines also becoming eligible. With no great increase in cost, though, we could select a 2½-liter limit, which would give us cars of first-class performance (weight limit of from 1400 to 1550 pounds, with possible power in the region of 180 bhp) and a formula that would really be intercontinental.

"From Italy there would be the Lancia Flaminia V6 and the Fiat 2100 six, and from France certain Simca engines. Germany could field her fuel-injected Mercedes 220SE or the basic 2½-liter BMW V8, while England would be well-placed with the 2.4 Jaguar, Austin-Healey six and the new Daimler SP250 V8. Last but far from least would be the new 'compact' engines from America, among which the Chevrolet Corvair shows every sign of being a potential winner. With a 2½-liter limit (152 cubic inches) we could count on engines produced in no less than five countries, and we'd see some widely varied technical concepts. Engines could be in front or rear, air-cooled or water-cooled, of six or eight cylinders, etc."

To SCI this idea of a "Senior" Formula 2 is violently exciting. It would be international from the beginning, without the need for "Formula C" amendments for U.S. consumption, and could produce some very interesting racing cars. Weight limits and the basic handicap of using a production engine would keep performance at a reasonable level, fractionally below that of the Formula 1 Grand Prize machines.

This, then, is the present state of Formula Junior in America, and an indication of what *could* happen in the future both here and in Europe. It looks very rosy. —*sci*

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March 1960

JAGUAR